New Vanguard

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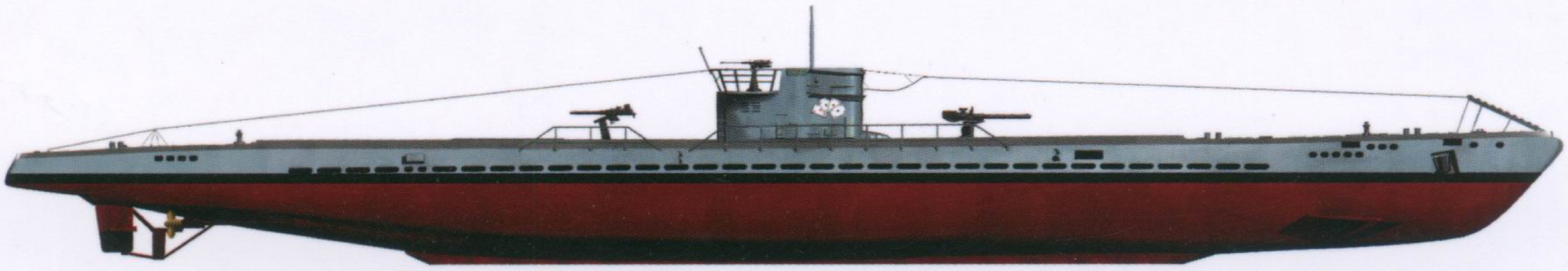
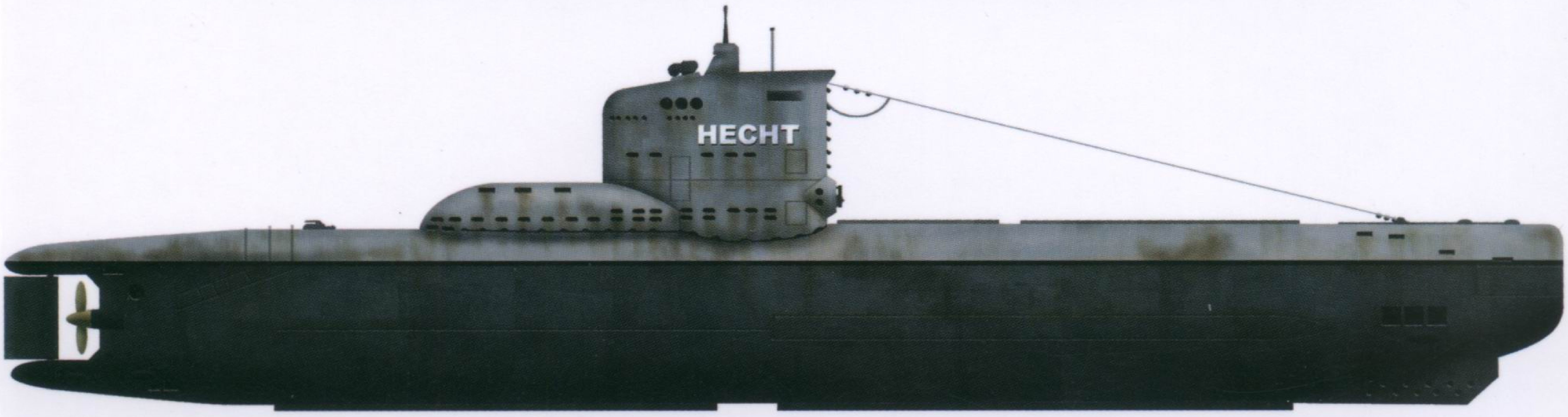
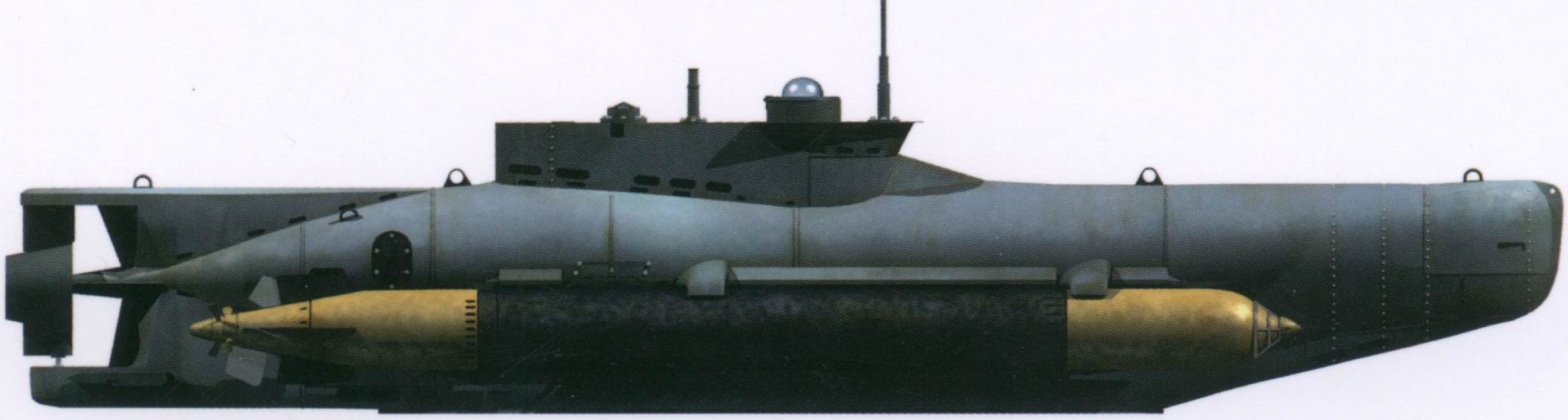
Kriegsmarine U-boats 1939–45 (2)







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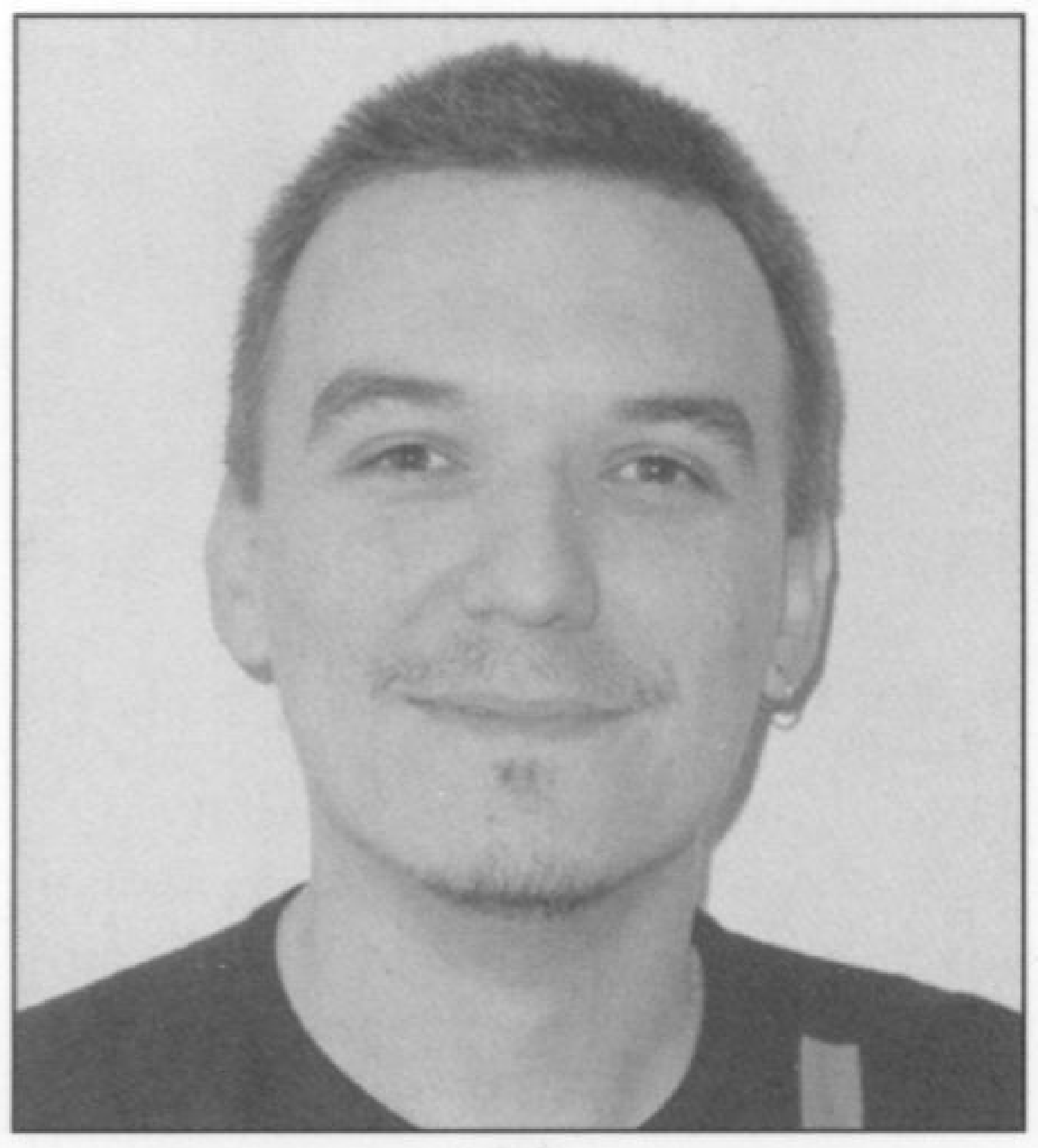

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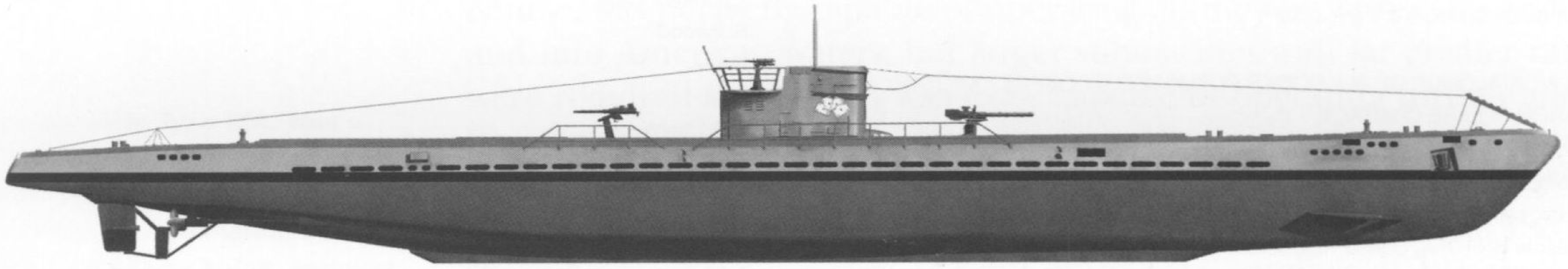

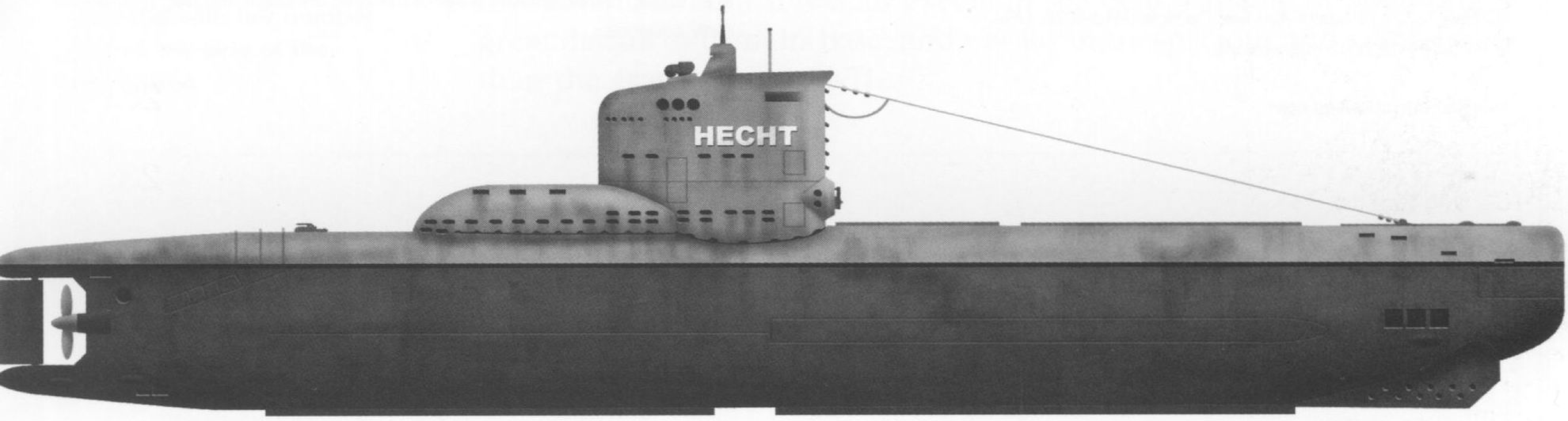

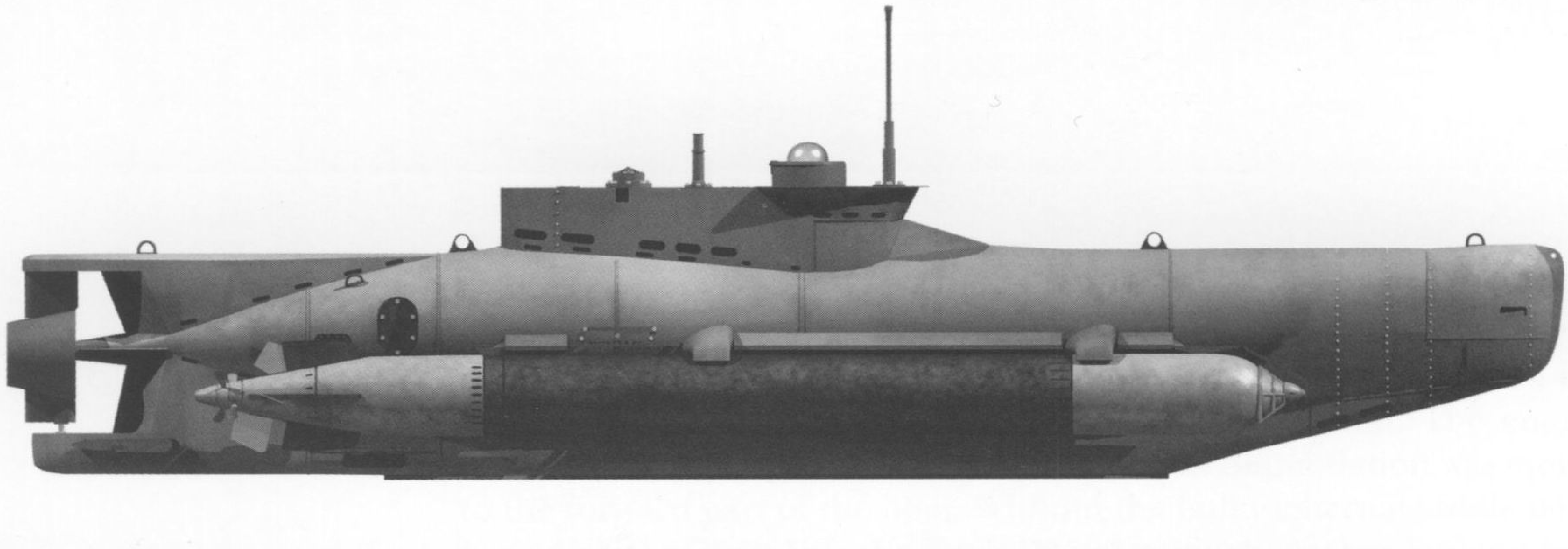

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The U-Boot Archiv is without doubt the single most important repository of information of the U-boats of the Kriegsmarine (and Kaiserliche Marine). It is a registered charity, which receives no official funding, and is dependent on the support of those who use the facilities. Herr Bredow and those who regularly assist him have done a magnificent job in recording the history and accomplishments of the U-Bootwaffe for posterity.

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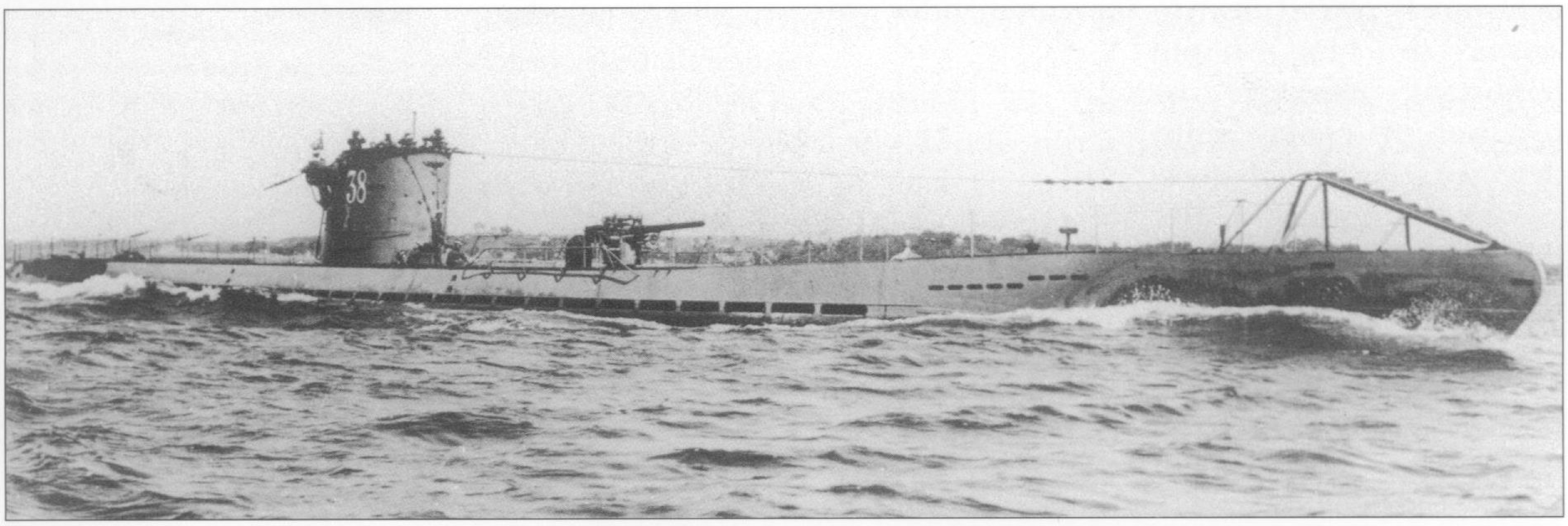
KRIEGSMARINE U-BOATS 1939–45 (2)

THE TYPE IX

The Type IX U-boat was a direct development of the unsuccessful Type IA (of which only two, U-25 and U-26, were built). Although the bulk of U-boat construction for the Kriegsmarine concentrated on the medium, sea-going Type VII, there was still a need for a larger ocean-going boat capable of operating in distant waters. The Type VII, of course, was perfectly capable of operating all the way across the Atlantic and into American waters, but larger submarines with far greater range were required if Germany was to be capable of operating further afield, far into the South Atlantic and even into the Indian Ocean. The result was the Type IX.

As with the Type VII, the design reached its optimum with the 'C' variant, which represented 141 out of the total number of 194 Type IXs built. The Type IX design was not without its drawbacks, which will be discussed later, but it was an excellent sea boat, capable of operating at great distances from its base, and was far more spacious and comfortable than the cramped Type VII.

U-38, an early Type IXA, was a highly successful boat. She carried out 22 war patrols under nine different commanders, sinking 33 enemy ships, and was scuttled at the end of the war on 5 May 1945. She is shown here pre-war, still with her number painted on the side of the conning tower.



Basic Description of Type

Although, with the exception of the lack of saddle tanks as fitted to the Type VII, the Type IX resembled its smaller cousin, particularly after both types had received the Turm 4 conning tower conversions, the Type IX was significantly different in its internal layout. The engine room was much larger and the junior NCO accommodation was moved to the forward part of the boat. Without the bulky external saddle tanks typical of the Type VII, the Type IX was a much sleeker looking boat and had greater fore and aft deck space. Its bigger size, however, meant that its diving speed was rather slower than the Type VII.

Beginning at the bow, the first compartment was the forward torpedo room with its four torpedo tubes. Along each side of the compartment were three upper and three lower bunks, which could be folded up to give more space when not in use. Folding tables were also provided. Due to the 'hot bunking' system used, these twelve bunks effectively were home to 24 sailors. Under the decking plates was storage for additional torpedoes, and at the rear of the compartment a hatch through the pressure hull onto the upper decking allowed fresh torpedoes to be taken on board.

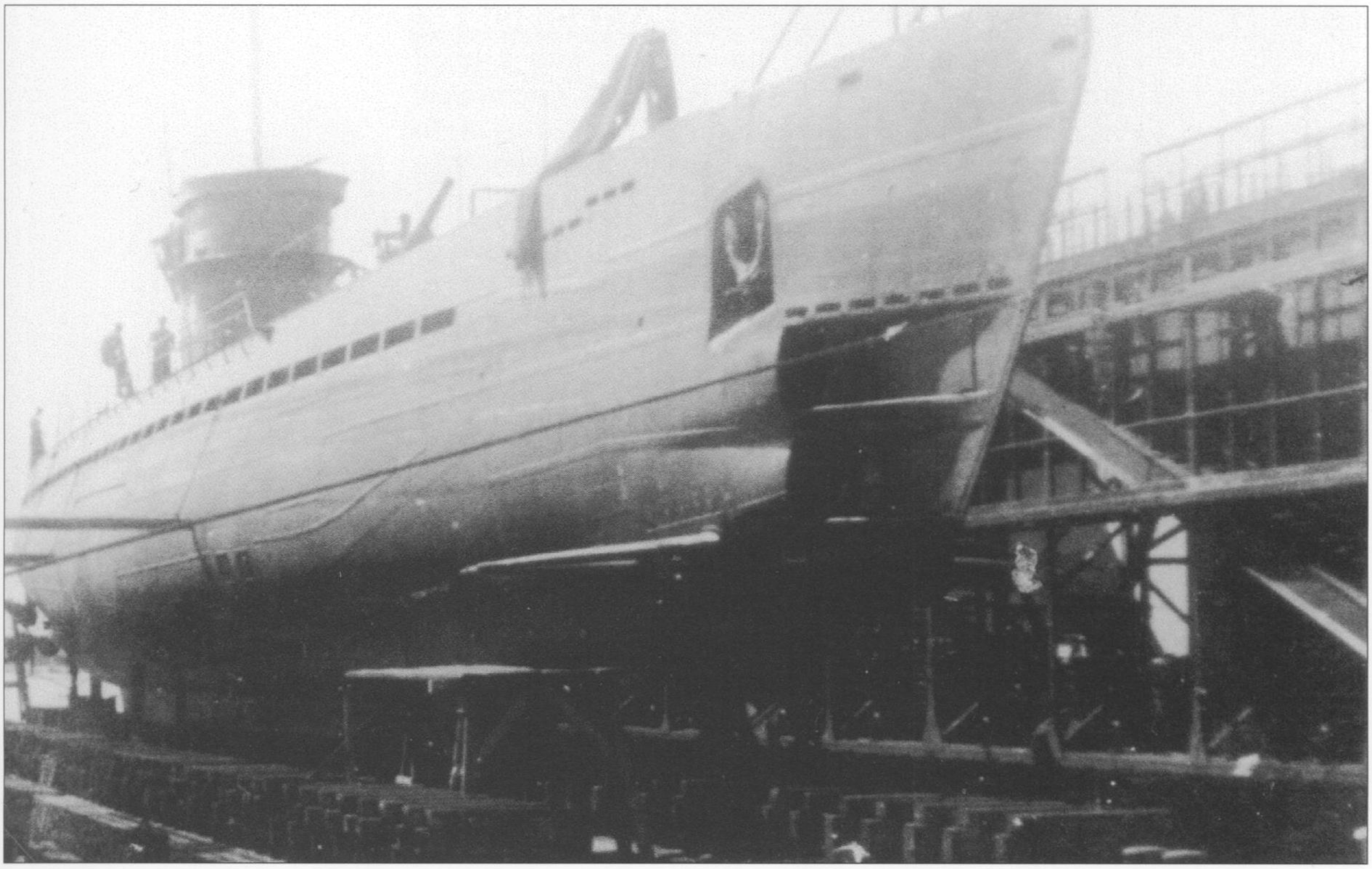
Through the first bulkhead was the main accommodation area. Forwardmost was the junior non-commissioned ranks area. On the port side was a W.C. compartment and two sets of bunks, whilst on the starboard were three sets of bunks, giving accommodation for ten men. Next followed the senior non-commissioned ranks area containing accommodation for six senior ranks. Under the deck plates of the accommodation area were stored the boat's batteries. Just beyond this accommodation area, separating the non-commissioned ranks from the officers, were the refrigerated storage lockers on the port and starboard side of the small galley. The boat's ammunition magazine was located under the deck plates of this area.

Through the next bulkhead was one officer's bunk on the port side, separated from the commander's 'compartment' by the sound room. To starboard were two officer's bunks and the radio room, directly opposite the commander. The commander's 'compartment' was a simple bunk area with a curtain that could be drawn to afford a modicum of privacy. The commander's bunk area was slightly more spacious than any other and also had the benefit of a small washstand with a folding lid to convert it into a table. As with the Type VII, the sound and radio rooms were deliberately placed next to the commander's area to allow immediate access to him should important messages be received or enemy ships detected. Further battery storage was located under the deck plates of this area.

The hub of the boat was the control room or *Zentral*. Here were the ship's helm, the diving planes, navigator's table, main ballast pump controls and periscope tubes. A ladder led up into the conning tower, which contained the commander's attack position, and on up to the main exit hatch to the bridge.

Aft of the *Zentral* was the Type IX's large engine room. First came the two large generator engines for

Members of the crew gather around the 10.5 cm forward deck gun of U-37, another very successful Type IXA. She carried out 22 war patrols and sank an incredible 55 enemy ships before being scuttled on 8 May 1945 at Eckernförde.



This photograph shows U-38 in dry dock, giving an excellent view of her hull shape and forward torpedo tube door. Note the lack of bulbous external saddle tanks as found on the Type VII. Her anchor is also clearly visible.

recharging the ship's batteries. Then came the two massive diesel engines, with only a small passageway between. Aft of the main engines were the electric motors used for powering the boat under water. On the starboard side was the large compressor used to recharge the boat's compressed air supply.

The aftermost compartment was the stern torpedo room. This contained the aft W.C., followed by two sets of upper and lower bunks each side, accommodating up to 16 men, as well as the two stern torpedo tubes and the emergency helm.

Type IXA

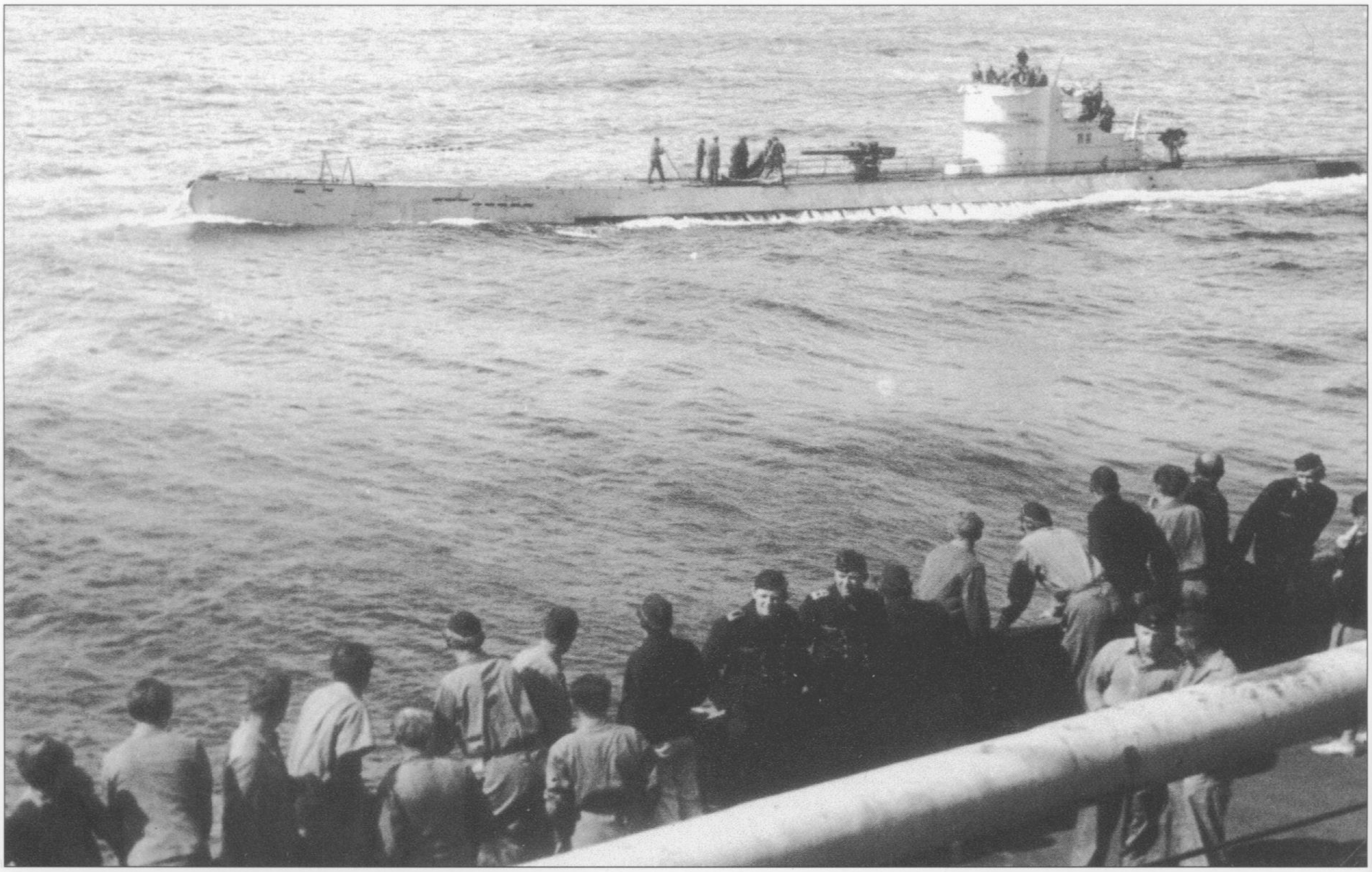
The Basic Type IXA was a well-armed, long-range boat, but only eight were constructed (U-37 to U-44) before the next, improved model was introduced.

SPECIFICATIONS	
Length	76.5 m
Beam	6.5 m
Draft	4.7 m
Displacement	1,032 tons surfaced, 1,153 tons submerged
Top Speed	18.2 knots surfaced, 7.7 knots submerged
Endurance	8,100 nautical miles surfaced, 65 nautical miles submerged
Powerplant	2 x MAN 2,200 bhp diesels, 2 x SSW 500 bhp electric motors
Armament	1 x 10.5 cm deck gun forward, 1 x 3.7 cm deck gun aft 1 x 2 cm flak gun on conning tower platform 6 torpedo tubes (4 bow, 2 stern) 22 torpedoes carried
Crew	48

Type IXB

The Type IXB was almost identical to its predecessor, with a small increase in fuel bunkerage giving it a slightly increased operational range, with its additional weight only causing a very slight reduction in its submerged top speed. The forward deck gun was also relocated to a position slightly nearer to the conning tower. 14 Type IXBs were constructed.

SPECIFICATIONS	
Length	76.5 m
Beam	6.8 m
Draft	4.7 m
Displacement	1,061 tons surfaced, 1,178 tons submerged
Top Speed	18.2 knots surfaced, 7.3 knots submerged
Endurance	8,700 nautical miles surfaced, 64 nautical miles submerged
Powerplant	2 x MAN 2,200 bhp diesels, 2 x SSW 500 bhp electric motors
Armament	1 x 10.5 cm deck gun forward, 1 x 3.7 cm deck gun aft 1 x 2 cm flak gun on conning tower platform 6 torpedo tubes (4 bow, 2 stern) 22 torpedoes carried
Crew	48



Despite having the second, lower flak platform added to the conning tower, U-161, a Type IXC, still has her aft 3.7 cm flak gun fitted. This boat carried out 11 successful war patrols before being sunk by enemy aircraft east of Bahia in September 1943.

Type IXC

The Type IXC was very slightly longer than the previous models, the principal improvement in the type being the provision of additional fuel bunkerage giving greatly extended operational range. 54 Type IXCs were commissioned.

SPECIFICATIONS

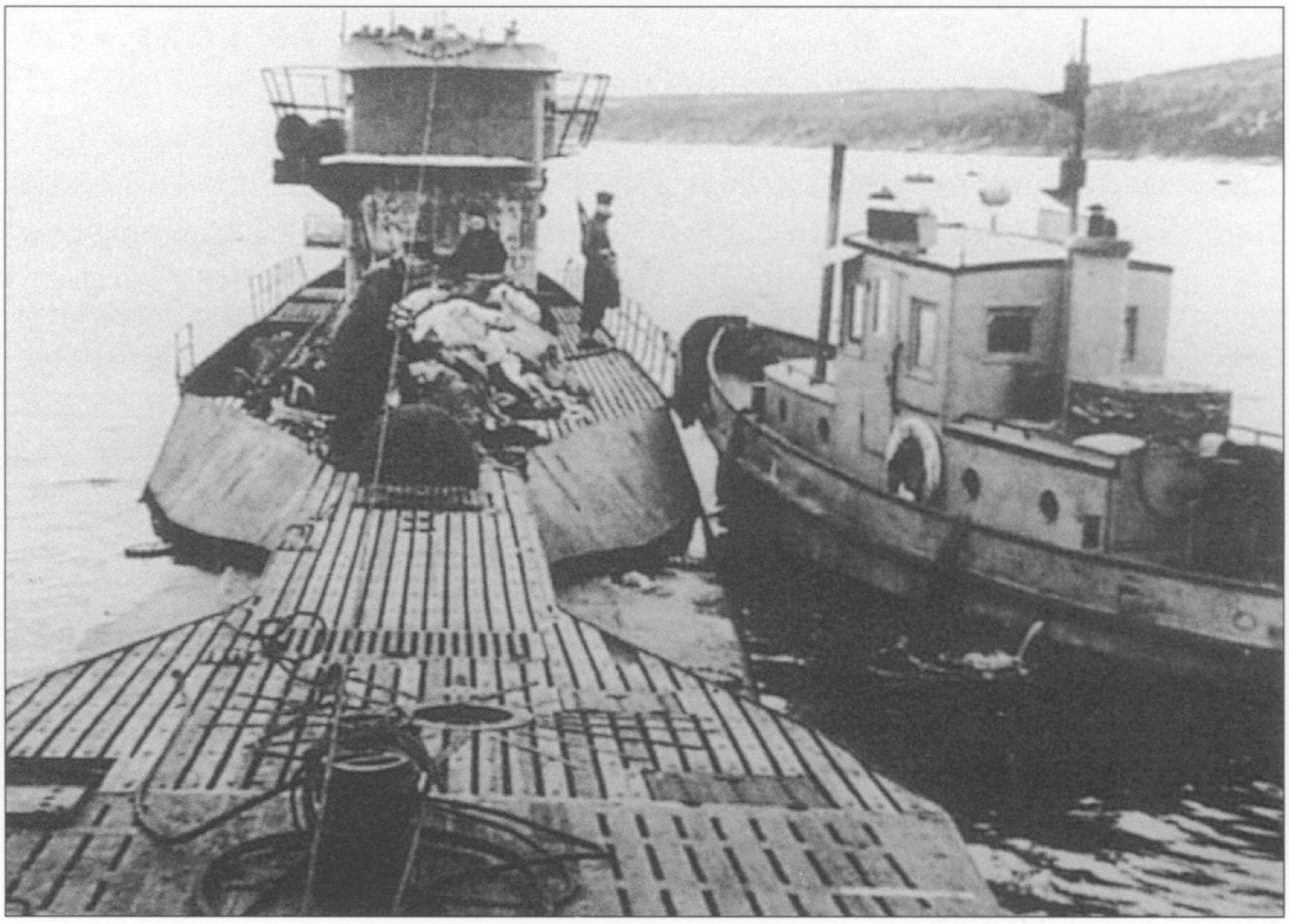
Length	76.8 m
Beam	6.8 m
Draft	4.7 m
Displacement	1,120 tons surfaced, 1,232 tons submerged
Top Speed	18.3 knots surfaced, 7.3 knots submerged
Endurance	11,000 nautical miles surfaced, 63 nautical miles submerged
Powerplant	2 x MAN 2,200 bhp diesels, 2 x SSW 500 bhp electric motors
Armament	1 x 10.5 cm deck gun forward, 1 x 3.7 cm deck gun aft 1 x 2 cm flak gun on conning tower platform 6 torpedo tubes (4 bow, 2 stern) 22 torpedoes carried
Crew	48

Type IXC/40

The Type IXC reached its zenith in the IXC/40 sub-type. Once again, minor tweaking of the design allowed a marginally increased fuel bunkerage, giving a further modest extension to the operational range. 87 of this model were produced, more than any other Type IX variant.

SPECIFICATIONS

Length	76.8 m
Beam	6.9 m
Draft	4.7 m
Displacement	1,144 tons surfaced, 1,257 tons submerged
Top Speed	18.3 knots surfaced, 7.3 knots submerged
Endurance	11,400 nautical miles surfaced, 63 nautical miles submerged
Powerplant	2 x MAN 2,200 bhp diesels, 2 x SSW 500 bhp electric motors
Armament	1 x 10.5 cm deck gun forward, 1 x 3.7 cm deck gun aft 1 x 2 cm flak gun on conning tower platform 6 torpedo tubes (4 bow, 2 stern) 22 torpedoes carried
Crew	48



An amendment was made to the outer casing of the foredeck on some Type IX boats in an attempt to speed up the relatively slow diving time of these large boats. This change can clearly be seen on this photograph of U-190, a Type IXD boat. This vessel carried out 11 war patrols and survived the war, surrendering on 10 May 1945.

Type IXD1

The Type IXD was a considerably enlarged variant, fully 11 metres longer than the original design. Though the operational range was reduced somewhat, this variant could achieve a highly respectable top speed in excess of 20 knots. This was achieved by substituting six Daimler Benz MB501 diesels, of the type used on the Kriegsmarine's E-boats, for the standard MAN diesels. Three of the MB501s were coupled to each shaft. Though fine in theory, in practice the experiment was not a success. Only two of this variant were completed, U-180 and U-195, and both experienced considerable technical problems with the engine arrangement, including overheating and the production of excessive exhaust smoke, which made the boat so much easier for the enemy to spot when running on the surface. Both boats were re-converted to produce the next, cargo-carrying sub-variant.

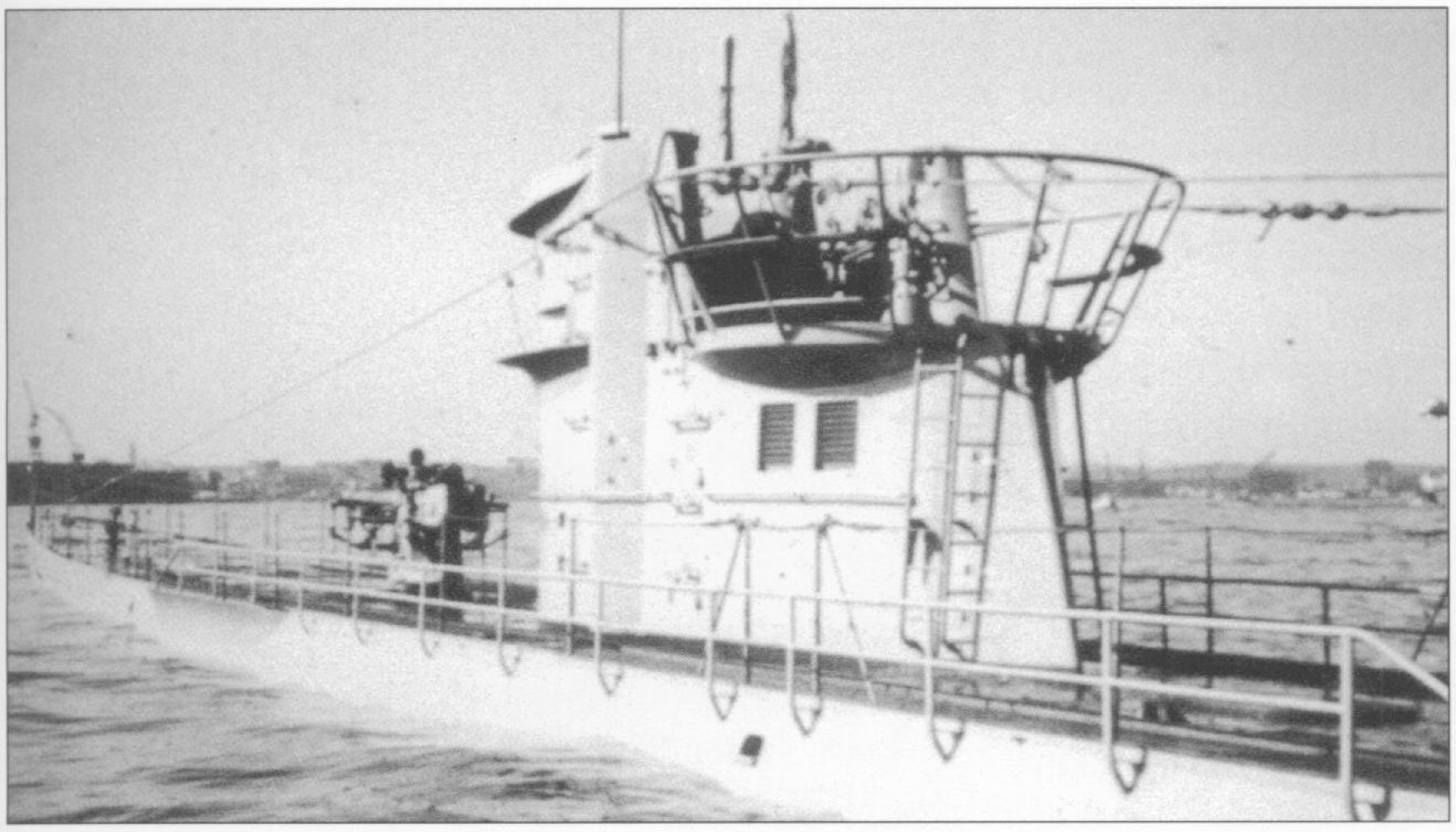
The crew of U-188 is mustered on the quarterdeck during the commissioning ceremony. The aft 3.7 cm flak gun is seen to good effect here. This boat carried out six patrols and sank 16 enemy ships under Kapitänleutnant Siegfried Lüdden. She was scuttled in August 1944.

SPECIFICATIONS	
Length	87.6 m
Beam	7.5 m
Draft	5.4 m
Displacement	1,610 tons surfaced, 1,799 tons submerged
Top Speed	20.8 knots surfaced, 6.9 knots submerged
Endurance	9,900 nautical miles surfaced, 57 nautical miles submerged
Powerplant	6 x Daimler Benz MB501 1,500 bhp diesels, 2 x SSW 500 bhp electric motors
Armament	1 x 10.5 cm deck gun forward, 1 x 3.7 cm deck gun aft 1 x 2 cm flak gun on conning tower platform 6 torpedo tubes (4 bow, 2 stern) 24 torpedoes carried
Crew	55

Type IXD1 (Cargo)

Converted from the original Type IXD1 specification, U-180 and U-195 had their Daimler Benz fast diesel motors replaced by conventional Germaniawerft submarine diesels. Also, the torpedo tubes were removed to provide additional cargo-carrying capability.

SPECIFICATIONS	
Length	87.6 m
Beam	7.5 m
Draft	5.4 m
Displacement	1,610 tons surfaced, 1,799 tons submerged
Top Speed	15.8 knots surfaced, 6.9 knots submerged
Endurance	9,900 nautical miles surfaced, 115 nautical miles submerged
Powerplant	2 x Germaniawerft bhp diesels, 2 x SSW 500 bhp electric motors
Armament	1 x 3.7 cm deck gun aft 2 x 2 cm flak gun on conning tower platform
Crew	55



Here we see a pristine U-177, a Type IXD boat, before seeing combat action. The 2 cm flak gun has not yet been fitted to its pedestal on the flak platform. Boats that had seen active service would soon show wear to the paintwork, and heavy rust staining.

Type IXD2

This interesting and relatively successful variant, the penultimate Type IX, used a twin-powerplant system. As well as its powerful supercharged MAN diesels, its lengthened hull allowed it to carry two additional diesel engines that could be used for cruising on the surface whilst the supercharged diesels were switched on to free-spinning mode to recharge the boat's batteries rapidly. A total of 28 of this variant were produced.

SPECIFICATIONS	
Length	87.6 m
Beam	7.5 m
Draft	5.4 m
Displacement	1,616 tons surfaced, 1,804 tons submerged
Top Speed	19.2 knots surfaced, 6.9 knots submerged
Endurance	23,700 nautical miles surfaced, 57 nautical miles submerged
Powerplant	2 x MAN supercharged 9-cylinder 2,200 bhp diesels, 2 x MWM 6-cylinder 500 bhp diesels, 2 SSW 580 bhp electric motors
Armament	2 x 2 cm flak guns on upper conning tower platform 1 x 3.7 cm or 2 cm *Flakvierling* on lower platform 6 torpedo tubes (4 bow, 2 stern) 24 torpedoes carried
Crew	57

Type IXD2/42

The flip side of the Type IXD1 concept, where the emphasis was on high speed, was the IXD2/42, in which the emphasis was on extending operational range to the maximum possible. Only one of this variant was produced.

SPECIFICATIONS	
Length	87.6 m
Beam	7.5 m
Draft	5.4 m
Displacement	1,616 tons surfaced, 1,804 tons submerged
Top Speed	19.2 knots surfaced, 6.9 knots submerged
Endurance	23,700 nautical miles surfaced, 57 nautical miles submerged
Powerplant	2 x MAN supercharged 9-cylinder 2,200 bhp diesels, 2 x MWM 580 bhp electric motors
Armament	1 x 10.5 cm deck gun forward, 1 x 3.7 cm deck gun aft 1 x 2 cm flak gun on conning tower platform 6 torpedo tubes (4 bow, 2 stern) 22 torpedoes carried
Crew	57

Flotillas

Although most U-boat flotillas contained a number of different U-boat types over the course of the war, there were certain flotillas in which a particular type predominated. The following flotillas are those that made heavy use of Type IX vessels:

2 Unterseebootsflotille
10 Unterseebootsflotille
12 Unterseebootsflotille
33 Unterseebootsflotille

Construction Details

IXA

Deschimag, Bremen	
U-37 to U-44	8 boats
Total for type	8 boats

IXB

Deschimag, Bremen	
U-64 to U-65	2 boats
U-103 to U-111	9 boats
U-122 to U-124	3 boats
Total for type	14 boats

XC

Deschimag, Bremen	
U-66 to U-68	3 boats
U-125 to U-131	7 boats
U-153 to U-160	8 boats
U-171 to U-176	6 boats
U-841 to U-846	6 boats
U-853 to U-858	6 boats
U-877 to U-881	5 boats
U-889 to U-891	3 boats
Total	44 boats
Seebeck, Wesermünde	
U-161 to U-166	6 boats
Total	6 boats
Deutsche Werke, Hamburg	
U-501 to U-524	24 boats
U-1221 to U-1238	18 boats
Total	42 boats
Total for type	92 boats

IXC/40

Seebeck, Wesermünde	
U-167 to U-170	4 boats
U-801 to U-806	6 boats
Total	10 boats
Deschimag, Bremen	
U-183 to U-194	12 boats
Total	12 boats
Deutsche Werke, Hamburg	
U-525 to U-550	26 boats
Total	26 boats
Total for type	48 boats

IXD1

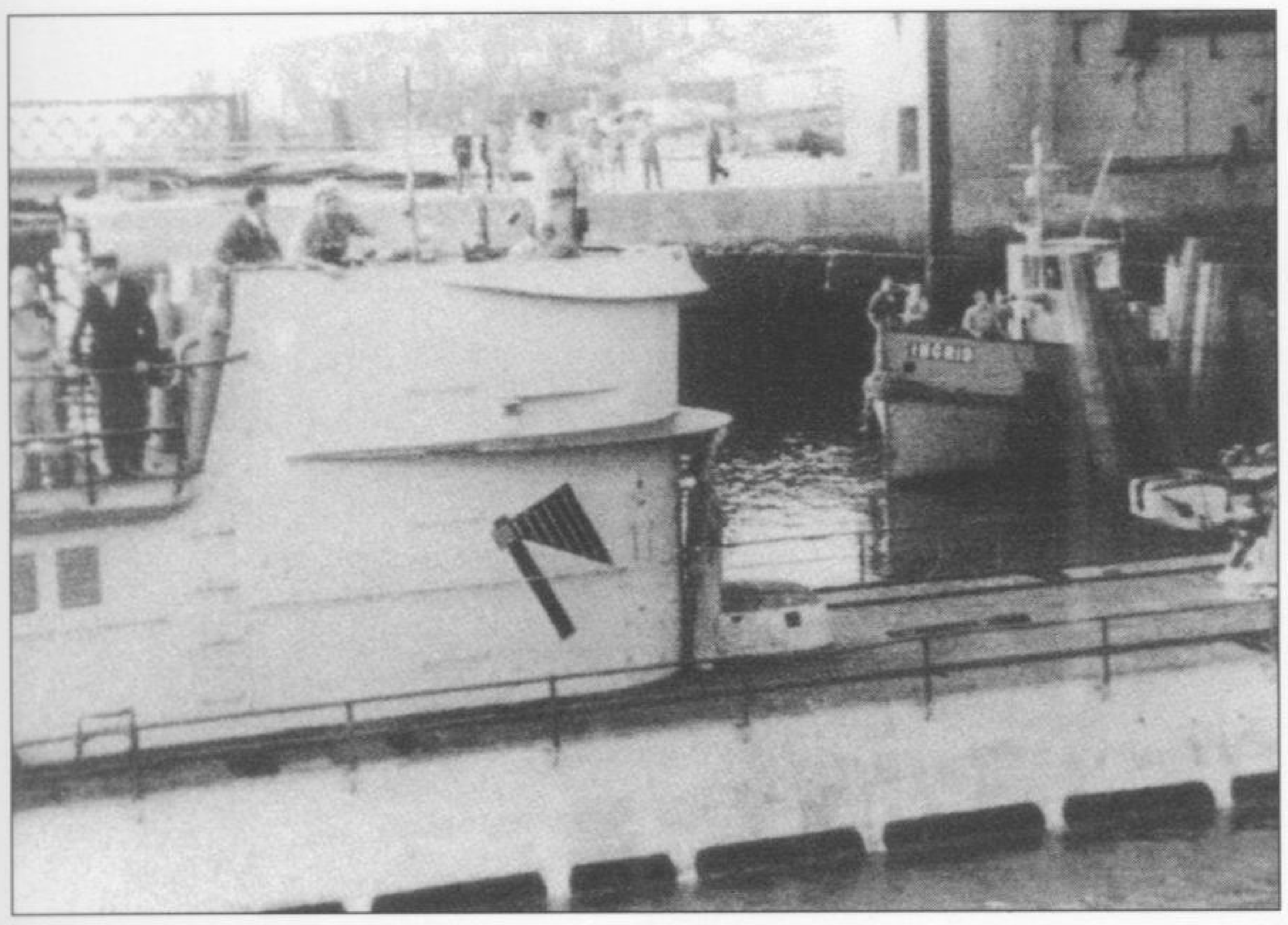
Deschimag, Bremen	
U-180	
U-195	
Total for type	2 boats

IXD2

Deschimag, Bremen	
U-181 to U-182	2 boats
U-196 to U-200	5 boats
U-847 to U-852	6 boats
U-859 to U-864	6 boats
U-871 to U-876	6 boats
U-883 to U-886	4 boats
Total for type	29 boats

Operational Use

The Type IX as we have already seen, was an excellent sea boat, larger and roomier than the Type VII. Its crew suffered somewhat less from overcrowding than their Type VII comrades. There were drawbacks, however, to serving on such a large, relatively spacious boat, not the least of which were the fact that a larger boat makes a larger target for the enemy, and that once spotted by the enemy, the Type IX had a significantly slower diving time than its smaller cousin. Lookouts on a Type IX therefore had to be particularly alert and watchful. A number of surviving U-boat veterans have confirmed that, when an opportunity was available, they elected to serve on a Type VII, knowing that its faster diving time might well mean the difference between life and death in a combat situation.



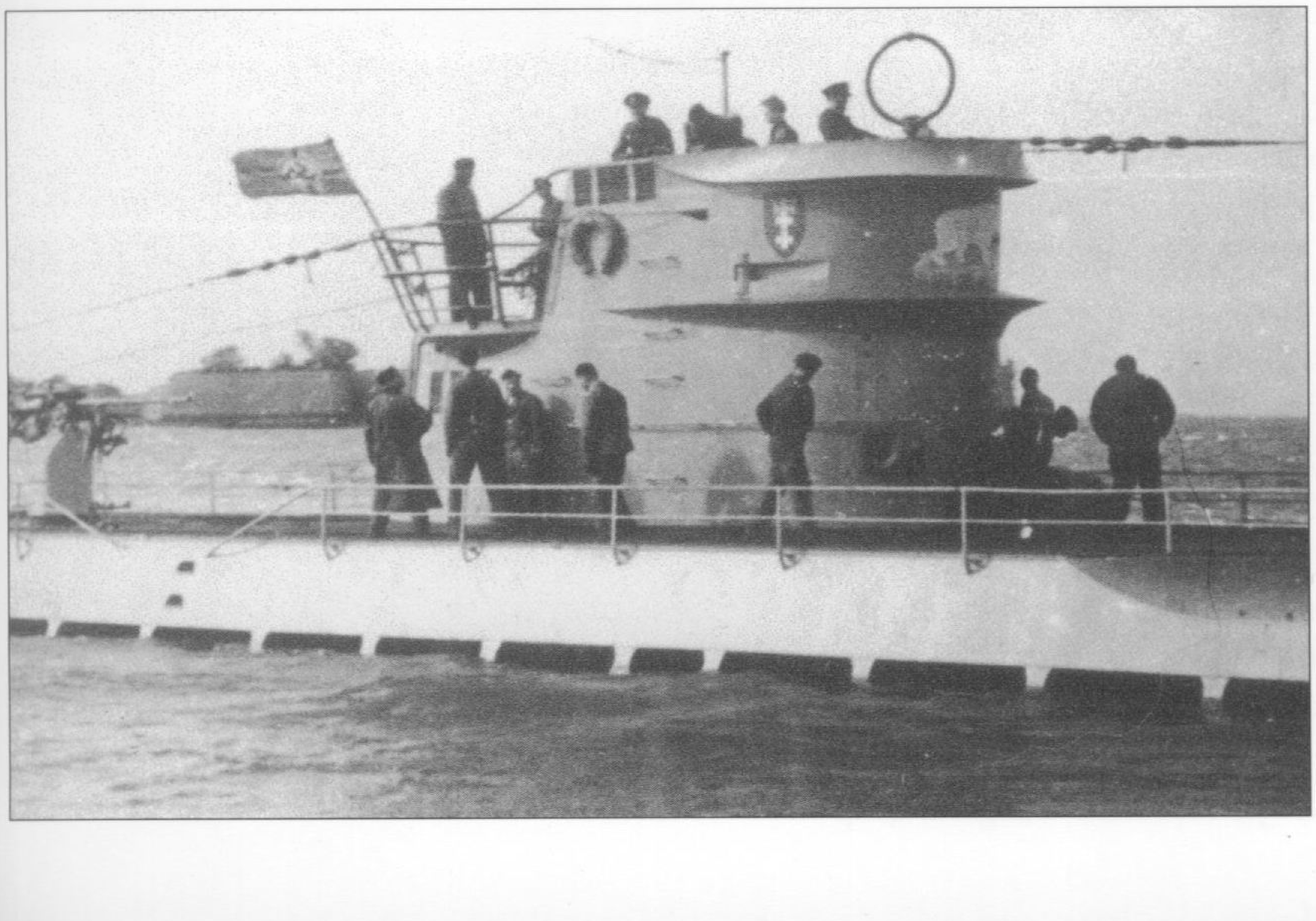
U-505 entering port. Note the large battle-axe emblem painted on the conning tower side. The bulge on the deck in front of the tower by the standing crewman is the housing for the boat's gyroscopic compass. Clearly noticeable here is the contrast between the pale grey hull sides and conning tower structure, and the dark grey decking.

This photograph shows U-108, a highly successful Type IXB with 25 sinkings to her credit over 22 war patrols. She was eventually scuttled at Stettin on 24 April 1945.

Of the 194 built, only 24 survived to the end of the war, a loss rate of 88 per cent. Nevertheless, many top aces achieved particularly impressive results using this large boat. The small sample given here may illustrate just how effective a weapon the Type IX was in the hands of an accomplished commander. Those top Type IX aces who survived the war are generally, though there are exceptions, those who gained their successes in the early part of the war then were posted to a shore command. Few U-boat commanders who gained their first command in the second half of the war survived long enough to become an ace.

Heinrich Liebe was one of the most experienced of the U-boat commanders, having taken command of his first boat in 1936. In October 1938, he took command of U-38, a Type IXA. Liebe was at sea when war broke out and on his first war cruise opened his score card when he sank two large British freighters. These were to be the first of many. He was decorated with the Knight's Cross on 14 August 1940 and added the Oakleaves on 10 June 1941. Those most successful U-boat commanders, specifically the ones who had been decorated with the Oakleaves, also qualified for a special diamond-studded version of the U-boat Badge. Though this was a personal gift from the C-in-C Navy rather than a formal award, it became the mark of the top aces. In total, before being transferred to a shore command, Liebe accounted for 32 enemy ships totalling 168,500 tons before being posted ashore to a position on the staff of Naval High Command. His boat, U-38, also survived the war at sea to be scuttled in Wesermünde on 5 May 1945. She was raised and broken up in 1948.

The first command of Kapitänleutnant Harald Gelhaus was U-143, one of the early Type IID boats. His first sinking, after taking over command from its previous commander, came on 23 August 1941. Shortly thereafter, he was given command of U-107, a Type IXB, with which he continued to run up a steady score of sinkings. Decorated with the Knight's Cross on 26 March 1943, Gelhaus ultimately reached a total of 18 enemy ships totalling 100,347 tons sunk. He was eventually transferred to a shore posting with Naval High Command and ultimately Marineober-kommando Nord. Unfortunately, his boat, under its new commander, was bombed and sunk on 18 August 1944 off the French coast. There were no survivors.



One of the best-known and respected U-boat aces was Korvettenkapitän Reinhard Hardegen. Hardegen's first command was U-147, a Type IID. Hardegen had originally served as a flier before transferring to submarines, gaining his first command in December 1940. Hardegen sank one enemy ship before being given a new command, U-123, a Type IXB. With this new boat, Hardegen was to achieve major successes. His first war cruise with U-123 resulted in five enemy ships being sunk. On the entry of the USA into the war, Hardegen operated off the US coast during Operation Drum Beat (Paukenschlag), sinking nine ships in his first operation there. His second cruise into US waters saw a further nine ships sunk, including one US Navy subchaser.

A good view of the bridge area as U-66, a Type IXC, pulls into port after a successful patrol. This successful boat carried out 19 war patrols and sank 33 enemy ships before being rammed and sunk by the USS *Buckley* off the Cape Verde Islands in May 1944.

Hardegen received the Knight's Cross on 23 January 1942, followed by the Oakleaves on 23 April of the same year. He was also a recipient of the U-boat Badge with Diamonds. In total, 24 ships representing some 138,200 tons fell victim to this accomplished airman turned U-boat ace. His career took another change of direction in the closing stages of the war when he was given command of a battalion in 2 Marine Infantry Division, ending the war as a combat infantry soldier.

U-123 was taken out of commission in June 1944 at Lorient and her engines used as generators. This highly successful boat was refitted by the French after the war and used by the French Navy as the *Blaison* until finally being decommissioned in 1959.

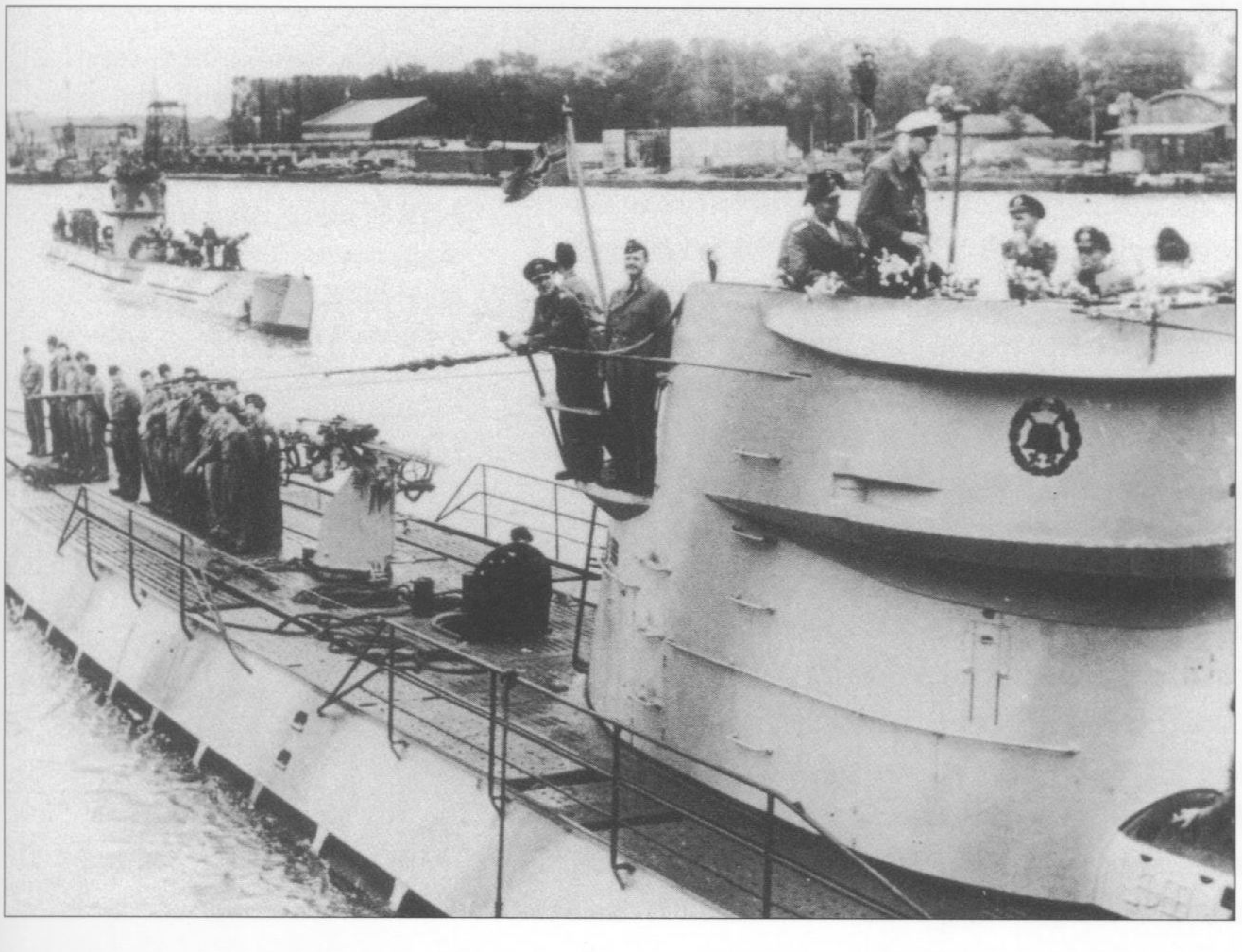
Korvettenkapitän Carl Emmerman, born in Hamburg in 1915, scored his first success as a U-boat commander at the end of May 1942 when he sank a 9,000-ton tanker. It was to be the first of many for this skilled commander. His boat, U-172, was a Type IXC. Emmermann was decorated with the Knight's Cross on 27 November 1942 and went on to achieve a total of 27 ships sunk, totalling some 152,904 tons, including the huge 27,000-ton troopship Orcades. He was awarded the Oakleaves on 4 July 1943 and was also one of only a small number of recipients of the U-boat War Badge with Diamonds. In the closing stages of the war, he was given command of a Type XXI before transferring first to take command of 31 U-Flotille, then leading a Marine Infanterie Battalion in the defence of Hamburg. U-172 was sunk on 17 December 1943 but her new commander and 45 of her crew were rescued.

Gunther Hessler took command of U-107, a Type IXB, in October 1940 after having served with the surface fleet on both capital ships and torpedo boats. He commanded U-107 until late 1941 and in that brief time span sank 21 enemy ships totalling some 118,800 tons. He was awarded the Knight's Cross on 24 June 1941. On giving up his command, he was transferred to the staff of the Commander-in-Chief of U-boats, his father-in-law, Grossadmiral Dönitz.

Johann Mohr was already serving as First Watch Officer aboard U-124, a Type IXB, when its captain was posted to another boat and Mohr given command. On his first cruise as commander, he sank six enemy ships, two on the second cruise and seven on the third, amongst the latter total being five large oil tankers. Ultimately, Mohr was to sink a total of 29 enemy ships representing some 135,000 tons and including a cruiser and a corvette. He was awarded the Knight's Cross on 27 March 1942 and the Oakleaves on 13 January 1943. Mohr's luck finally ran out in March 1943 when he was attacked and sunk by the frigate *Stonecroft* and corvette *Black Swan*. The boat was lost with all hands.

One of the older U-boat captains, Victor 'Papa' Schutze, was already 33 years old when war broke out. As captain of U-25, a Type IA, he scored his first victory in October 1939 and was already a holder of the Knight's Cross by December 1940. After the award of the Knight's Cross, he was given command of a new boat, U-103, a Type IXB. Schutze was one of the true experten, running up a final total of 35 enemy ships sunk, for a total of 180,000 tons. Amongst his many achievements, Schutze succeeded in sinking over 65,000 tons of shipping – some thirteen ships – within a space of just six weeks. He was decorated with the Oakleaves on 14 July 1941 and was also a holder of the U-boat Badge with Diamonds. U-103 had several other commanders after Schutze and survived intact until being taken out of service in March 1944. In February 1945, she was moved to Hamburg where she was moored and her engines used as power generators before she was finally scuttled in May 1945.

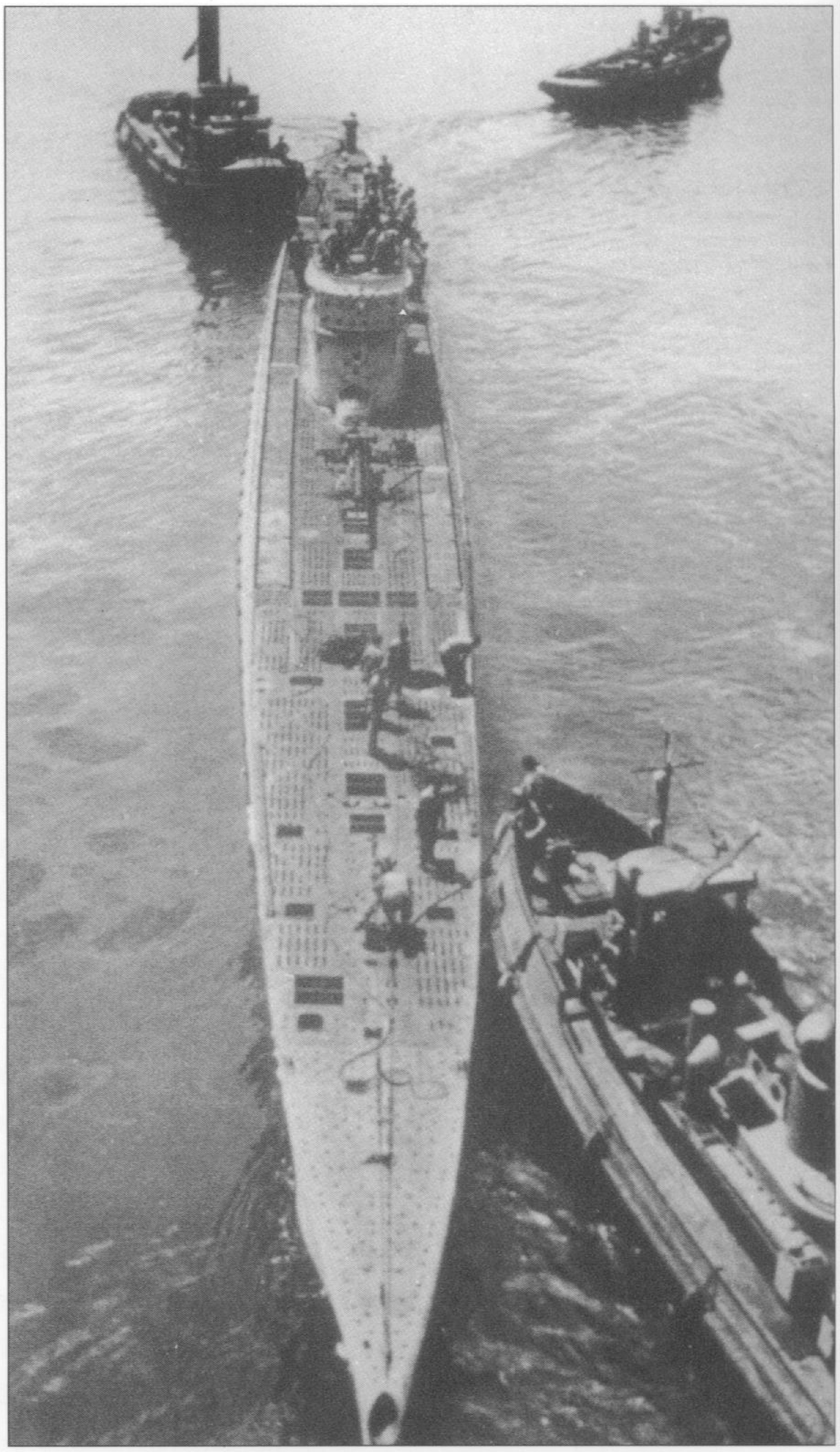
U-156, a Type IXC boat under the command of Kapitänleutnant Werner Hartenstein, was involved in one of the war's most controversial incidents. Hartenstein was an acknowledged ace, and holder of the Knight's Cross with a total of 19 enemy ships, representing some 97,100 tons, to his credit. On 12 September 1942, Hartenstein encountered and sank the 17,000-ton *Laconia*. Unknown to him, the boat was also carrying a significant number of Italian POWs as well as a number of women and children. When he realised the scale of the disaster he surfaced, took some of the injured on board, and took several of the lifeboats in tow. Hartenstein then sent a message in clear offering safe passage to any ship that would come and rescue the survivors. The response was that a Liberator bomber flew over and bombed the boat despite the extreme risk to the survivors. It had clearly been decided that



Another of the war's most successful boats, this is U-1232, a Type IXB. Variously commanded by Karl-Heinz Moehle, Reinhard Hardegen and Horst von Schroeter, all Knight's Cross winning aces, she carried out 26 patrols and sank 47 enemy ships. She was finally blown up by the Germans at her base in Lorient in August 1944 to prevent her capture. The aft 3.7 cm flak gun can be clearly seen.

the sinking of a U-boat was more important than the rescue of the survivors. In desperation, Hartenstein was forced to abandon the survivors and dive his boat to avoid it being sunk. Fate caught up with Hartenstein when U-156 was caught on the surface by US aircraft and sunk with all hands on 8 March 1943. Subsequent to the *Laconia* incident, Dönitz ordered that in future no captain should put his own boat and crew at risk by trying to rescue survivors. This, the so-called 'Laconia Order', saw him charged with war crimes at the Nuremberg Trials.

Karl-Friedrich Merten was another of the 'old-guard' of U-boat commanders, already 34 years old with 13 years service in the Navy when war broke out. He had served first with the surface fleet, on battleships, cruisers, escort ships and torpedo boats, before joining the U-Bootwaffe at the beginning of 1940. In February 1941, he took command of U-68, a Type IXC, and carried out several successful war cruises, ranging into the South Atlantic where he operated off the coast of Africa as well as into the Caribbean. Merten sank a total of 29 enemy ships, earning himself the Knight's Cross in June 1942 and adding the Oakleaves in November of the same year. Like many senior U-boat veterans, Merten was given a shore command, first with 26 U-Flotille then with 24 U-Flotille in the Baltic port of Memel. From here, at the end of the war, he was instrumental in evacuating over 56,000 refugees from the advance of the Red Army. U-68 served on under two other commanders until 8 April 1944 when she was caught on the surface at night by US aircraft and sunk. Only one crew member survived.



The long, symmetrical cigar shape of the Type IX hull can be seen to good effect in U-188, a Type IXD boat, photographed here in June 1943 being manoeuvred by tugs. Note in particular the lack of bulbous external saddle tanks seen on the Type VII.

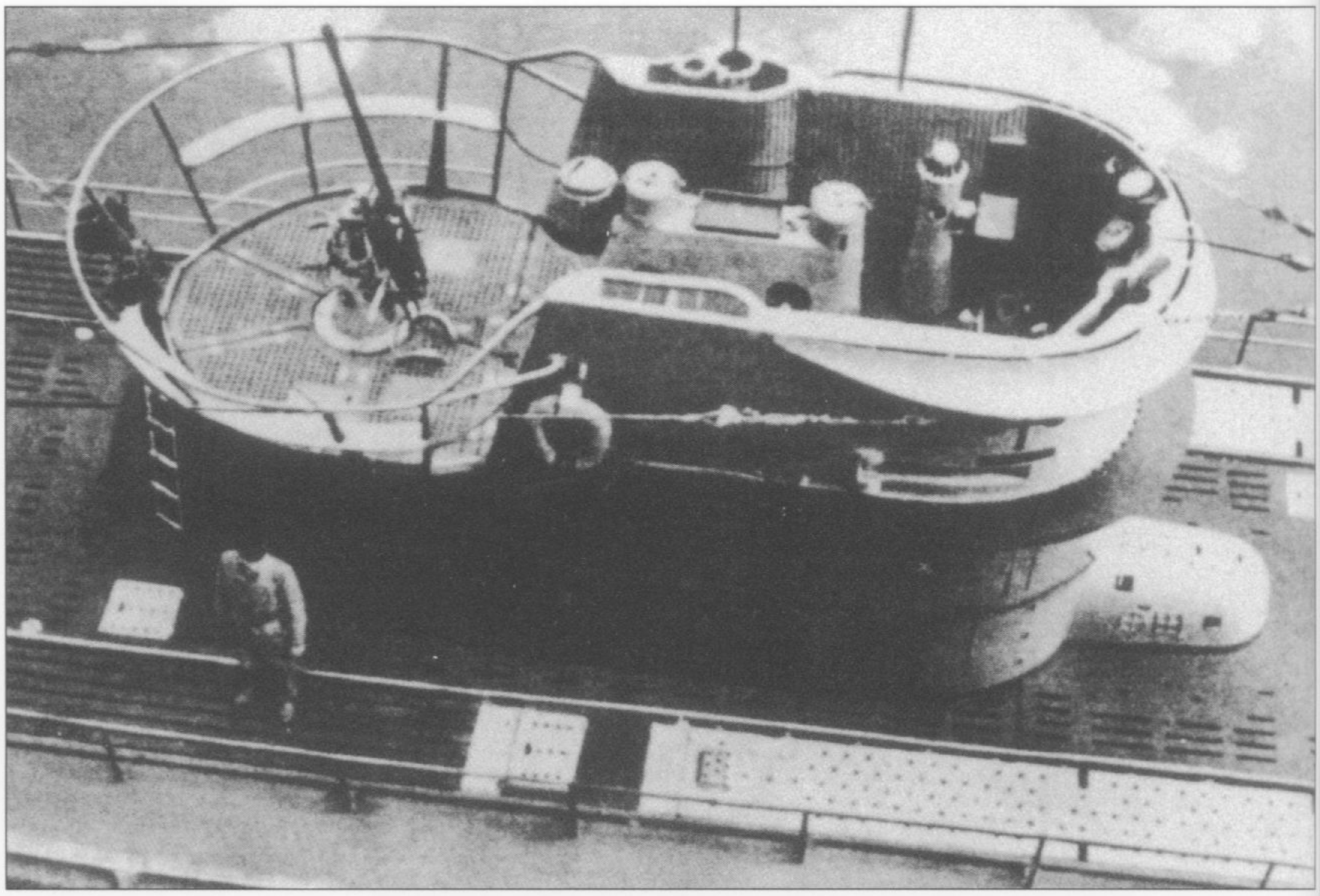
Another veteran of the early days of the U-Bootwaffe who earned ace status with the Type IX was Werner Hartmann. Hartmann had commanded U-26 in pre-war days, with a young Gunther Prien as his Watch Officer. His first wartime cruise was as commander of U-37, a Type IXA, during which he sank eight enemy ships. His second war cruise netted eight more enemy ships, earning him the Knight's Cross on 9 April 1940 along with a shore posting to the staff of U-boat command. He later took command of the 2nd U-boat Training Division and other posts in the training branch before returning to sea in command of U-198, a Type IXD2, in November 1942, at the age of 40 years. He proceeded to take his boat on a 200-day war cruise during which he sank a further seven enemy ships. His final tally reached 25 ships, totalling some 111,600 tons, bringing him the Oakleaves to his Knight's Cross on 5 November 1944. On 14 February 1945, he was given command of Marine Grenadier Regiment 2, part of 2 Marine Infanterie Division, as so many of Germany's 'sailors without ships' were thrown into action in the war on land. U-37 survived the war at sea to be scuttled in May 1945. U-198 was less fortunate and after being attacked by enemy aircraft was finally sunk by a combined attack from the sloop *Godavari* and frigate *Findhorn* off the Seychelles on 12 August 1944. There were no survivors.

U-183, a Type IXD, prepares to refuel from a tanker at sea. This was to become an increasingly rare luxury as one by one the Kriegsmarine's surface tankers and the submarine tankers, or Milch Kühe, were picked off by the Allies.

Of all Germany's great U-boat aces, few can compare with Wolfgang Lüth. An ace of aces, Lüth had commanded U-138, U-43 and U-181, boats of the IXB, IXA, and IXD2 types, respectively. His first boat, however, was a diminutive Type IIB, the U-9. Lüth had already signalled his great potential by sinking a French submarine, the *Doris*, with his tiny coastal 'Canoe' in one of the war's rare submarine v. submarine encounters. Moving on to the bigger Type IX boats, he quickly began running up an impressive score. He was awarded the Knight's Cross on 24 October 1940 with a score of 49,000 tons. By the time the Oakleaves were added to his Knight's Cross in November 1942, his score had reached 81,950 tons. His score continued to rise, and in 15 April 1943 when the Swords were added to his Oakleaves, his score had reached 103,712 tons. In the end, Lüth accumulated a score of 47 enemy ships representing over 221,000 tons, and on 9 August 1943 became one of only two naval officers to be decorated with the Oakleaves, Swords and Diamonds clasp to the Knight's Cross. The other, Brandi, was also a U-boat commander. Of Lüth's boats, U-43 was sunk with all hands by US aircraft off the Azores on 30 July 1943, U-138 was sunk after depth-charge attacks by a combined force of five Royal Navy destroyers, but the entire crew was saved, and U-181 was taken over by the Japanese at her base in Penang, Malaysia, after the German surrender.

It is not simply in the sheer scale of the number of his sinkings that Lüth stood head and shoulders above almost all other U-boat aces. In one spell of 192 days, Lüth carried out three war cruises and sank 11 ships. On another single, extended war cruise of 129 days, Lüth added 12 more ships to his list of victims. One amazing cruise saw Lüth at sea for 206 days in U-181, adding ten more enemy ships to his score.

Lüth was eventually transferred to a shore posting and given the position of commander of the German Naval Academy at Flensburg-Mürwick. Tragically, having survived the Battle of the Atlantic where so many of his comrades had lost their lives, Lüth was shot dead by one of his own sentries on 14 May 1945, after the end of the war. This was in the immediate post-war period where numerous German units had been permitted to retain some small arms and post sentries for their own security. Lüth had been challenged by a young sentry and had either not heard, or ignored, the challenge. He was buried two days later with full military honours.



An aerial view down into the conning tower of a Type IXC. Some idea of the relatively spacious nature of the Type IX deck, in comparison with the smaller Type VII, is indicated by the size of the crewman.

The U-Bootwaffe rewarded not only its ace submarine commanders but those other crew members who had made a significant contribution to the success of their boat. In this respect, both chief engineer Oberleutnant zur See Karl-August Landfehrmann and Watch Officer Oberleutnant zur See Johannes Limbach, both serving on U-181 with Wolfgang Lüth, shared in his recognition when they were decorated with the Knight's Cross on 27 October 1943 and 6 February 1945 respectively, though Lüth had already long since moved to other duties by the time of the latter award.

ARMAMENT

Deck Gun

The standard deck gun fitted to the Type IX in the early part of the war was the 10.5 cm Schiffskanone C/32 mounted in the identical pedestal fitting as used for the smaller 8.8 cm weapon on the Type VII. Able to traverse through 360 degrees, it fired a 23-kilo projectile up to 15,300 metres. A crew of three was required to operate the gun, with additional crew members being engaged in keeping the gun supplied with ammunition from the magazine in the boat's interior. As the war progressed, it became clear that any benefits derived from the presence of the deck gun were offset by the increase in the drag imposed on the boat when moving under water. By 1943, most deck guns had been removed from Type VIIs, but for some reason most Type IX boats retained their 10.5 cm guns. The principal exception to this was the Type IXD2, particularly those boats of this type operating in the Atlantic.

3.7 cm Flak M/42

Initially fitted on the afterdeck of the Type IXA and IXB, this heavy flak gun was eventually moved onto the lower 'wintergarden' conning tower platform on later models. It fired a shell weighing .073 kilos up to 15,350 metres.

On some vessels, due to shortages of the 3.7 cm, a quadruple 2 cm Flakvierling was fitted on the lower 'wintergarden' platform.

2 cm Flak 30/Flak 38

The Flak 30 was originally fitted as a single-barrelled anti-aircraft weapon on the upper tower of Type IXA and Type IXB. It was replaced by the

Flak 38, which was an improved version having more than three times the rate of fire of the Flak 30. This was used in both single-barrel and twin mounts on the upper conning tower platform.

TORPEDOES

German torpedo nomenclature can be extremely confusing. There were, however, only two principal types of torpedo used on U-boats, but with several variants in detonating devices (the pistol) and in directional control. These two principal types were, in fact, developments of torpedoes used in the First World War: the G7a and the G7e. By the Second World War, torpedo sizes had been standardised at 54 cm (21 in.) so that all torpedoes, whether launched from surface ships or U-boats, were of the same diameter. The standard length was 7.16 m and some 280 kilos of explosive was contained in the warhead.

Germany had, in fact, suffered from problems of crisis proportions with its torpedoes. From the early 1940s, reports of dud torpedoes began to flood in. It is estimated that during the Norwegian Campaign, in excess of 75 per cent of attacks failed due to faulty torpedoes. The problem lay not only in the failure to sink enemy ships, but that the enemy were often alerted to the presence of the U-boat during these failed attacks, and a number of boats were lost in the subsequent counterattack by the escort ships.

The faults were eventually diagnosed as being due to the effect of the compressed air used to launch the torpedo. Pressure sensitive depth keeping mechanisms in the torpedoes then caused them to run too deep and pass harmlessly under their intended target, due to variations in the Earth's magnetic field affecting sensitive magnetic detonator pistols in the torpedoes, and faulty contact triggers (the small 'propeller' on the nose of the warhead). As a result of the problems, several members of the Torpedo Research Establishment were court-martialled for gross dereliction of duty when it was discovered that the pre-war testing of the torpedoes was mismanaged and torpedoes were accepted even after unsuccessful or at best only partially successful tests.

Even later in the war, when it was assumed that the various old faults had been dealt with, the new acoustic torpedoes brought new faults of their own. Over-sensitive torpedoes were being set off by the turbulence of the ship's wake and detonating before they actually reached the target. Many boats would dive as soon as they had launched their torpedo to avoid retribution from the escorts and, hearing the

With its decks constantly washed by heavy seas, as can be seen here, it did not take long for a U-boat operating in Arctic waters to ice up. The frozen forward deck of U-109, a Type IXB, is seen here. This boat carried out 17 war patrols and sank 14 enemy ships before being bombed and sunk by RAF aircraft north-east of the Azores in May 1943.

torpedo detonate, would assume a hit on the target, not realising that at worst the enemy vessel might have had its propellers blown off, or in many cases be unharmed.

G7a(TI) The G7a(TI) was a relatively simple weapon, propelled by steam from the burning of alcohol in air, supplied by a small on-board reservoir. The torpedo was driven by a single propeller. The G7a(TI) had a top speed of some 44 knots and a range of up to 6 kilometres. Its biggest drawback was its visible 'bubble' wake.

ABOVE **Here we see the aft 3.7 cm flak gun, fitted to many early Type IX boats, in action. Later configurations had their flak armament concentrated on the conning tower platforms.**

G7e(TII) Broadly similar to the G7a model, the G7e was electrically powered, being driven by a small 100 bhp electric motor. In this case, two contra-rotating propellers were fitted. The G7 series left no visible wake. The G7e(TII) had a range of some 5 kilometres at 30 knots.

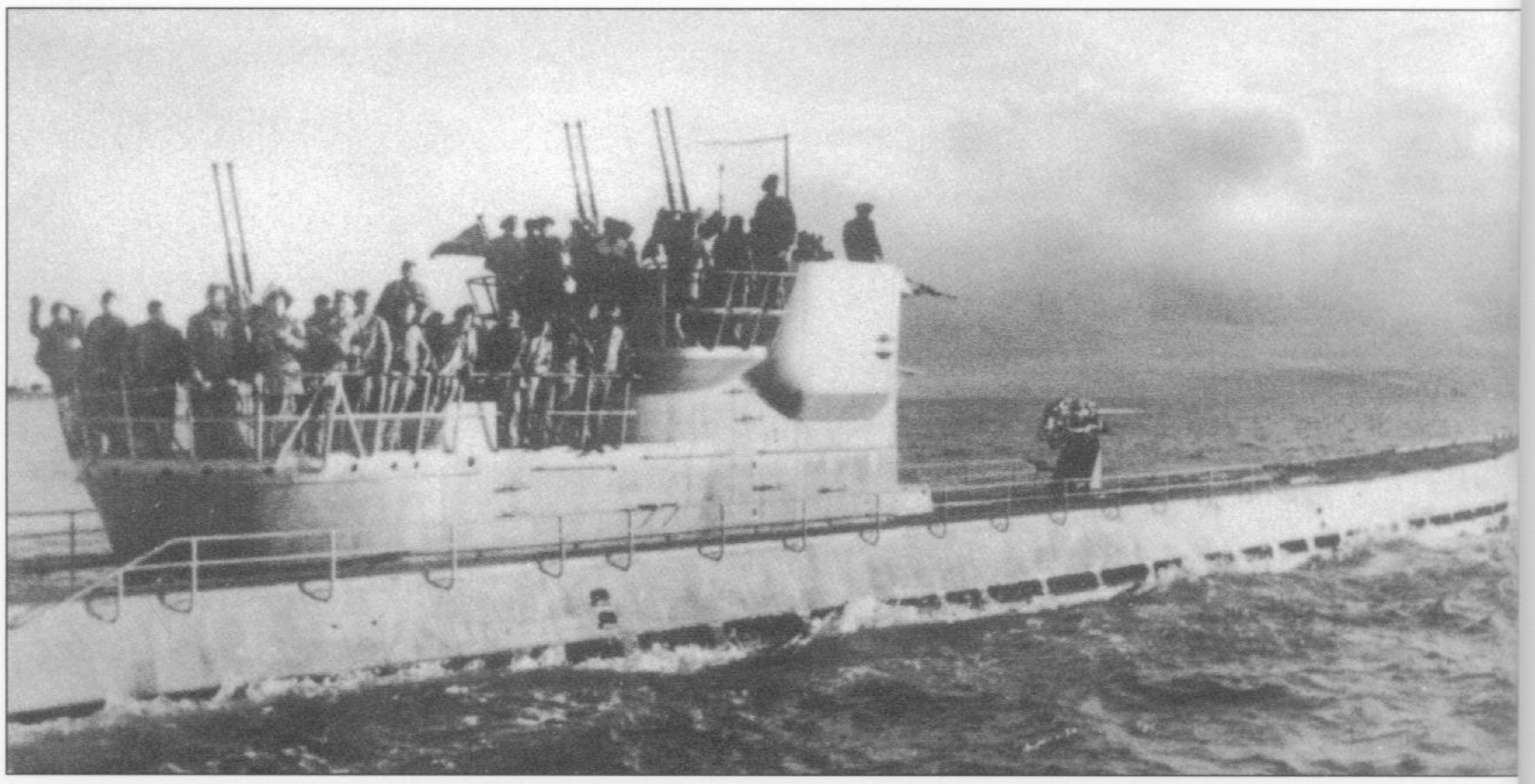
G7e(TIII) This was a development of the G7e(TII) with greater battery capacity, allowing its effective range to increase to 7.5 kilometres.

The pistols used to detonate the torpedo were a source of great trouble to the U-Bootwaffe, with numerous failures to detonate being recorded in the early part of the war. The basic pistol was a dual-function component that could be activated by contact (Abstandzündung), or by the detection of the magnetic field generated by the hull of the ship (Magnetischerzündung).

Directional Control

Three principal types of directional control were developed in the Second World War, all of which, after teething problems were eliminated, were used with some success.

FaT (Flächenabsuchenden Torpedo) The original FaT design was first used on the G7a(TI). It was an excellent anti-convoy concept, in that instead of making a direct line to the target, it had the torpedo running in an 'S' configuration through the convoy until finding a target. The required launch position was alongside the convoy. A further development, the FaTII, was based on the G7e(TII).



BELOW **This photograph of U-515, commanded by Korvettenkapitän Werner Henke, shows the powerful flak armament carried on Type IX boats during the second half of the war. In this case, three sets of twin 2 cm flak guns are fitted. After 11 war patrols and 23 enemy ships sunk, U-515 was depth-charged and forced to the surface where she was captured by the US Navy. She is today preserved at the Museum of Science and Industry in Chicago, USA.**

LuT (Lagenabhängiger Torpedo) This torpedo, similar in concept to the FaT, allowed the U-boat to attack the convoy from any angle rather than having to attain the ideal launch position alongside.

Zaunkönig (TVb) This torpedo, based on the G7e, had acoustic detectors which homed in on the sounds of the target vessel's propellers. It was, however, prone to premature detonation when passing through turbulent waters, such as the wake of a ship. This torpedo had a range of 5.75 kilometres at 24.5 knots.

Zaunkönig II (TXI) This was a development of the basic Zaunkönig, which had the acoustic detectors tuned to specific frequencies of ship's propellers to avoid premature detonation, and was to be used with some success as an anti-escort weapon, fired from the stern torpedo tube against pursuing escort vessels.

MINES

There were a number of developments in submarine-launched mines during the Second World War, of which the four most significant were the TMA, TMB, TMC and SMA.

TM(*Torpedominen*)A

This mine was for use in depths of up to 270 metres and carried an explosive charge of some 215 kilos. Launched through the torpedo tube, it was of the same diameter as the standard torpedo, but shorter at 3.4 metres so that two could be launched from each tube at the same time.

TMB

Designed for use in shallow waters of up to just 20 metres, the TMB was shorter again, at just 2.3 metres, but carried a 580-kilo charge. Three could be carried in and launched from each tube.

TMC

This was a development of the TMB, larger at 3.3 metres in length, but with a 1000-kilo charge. Two could be carried in and launched from each tube.

SM(*Schachminen*)A

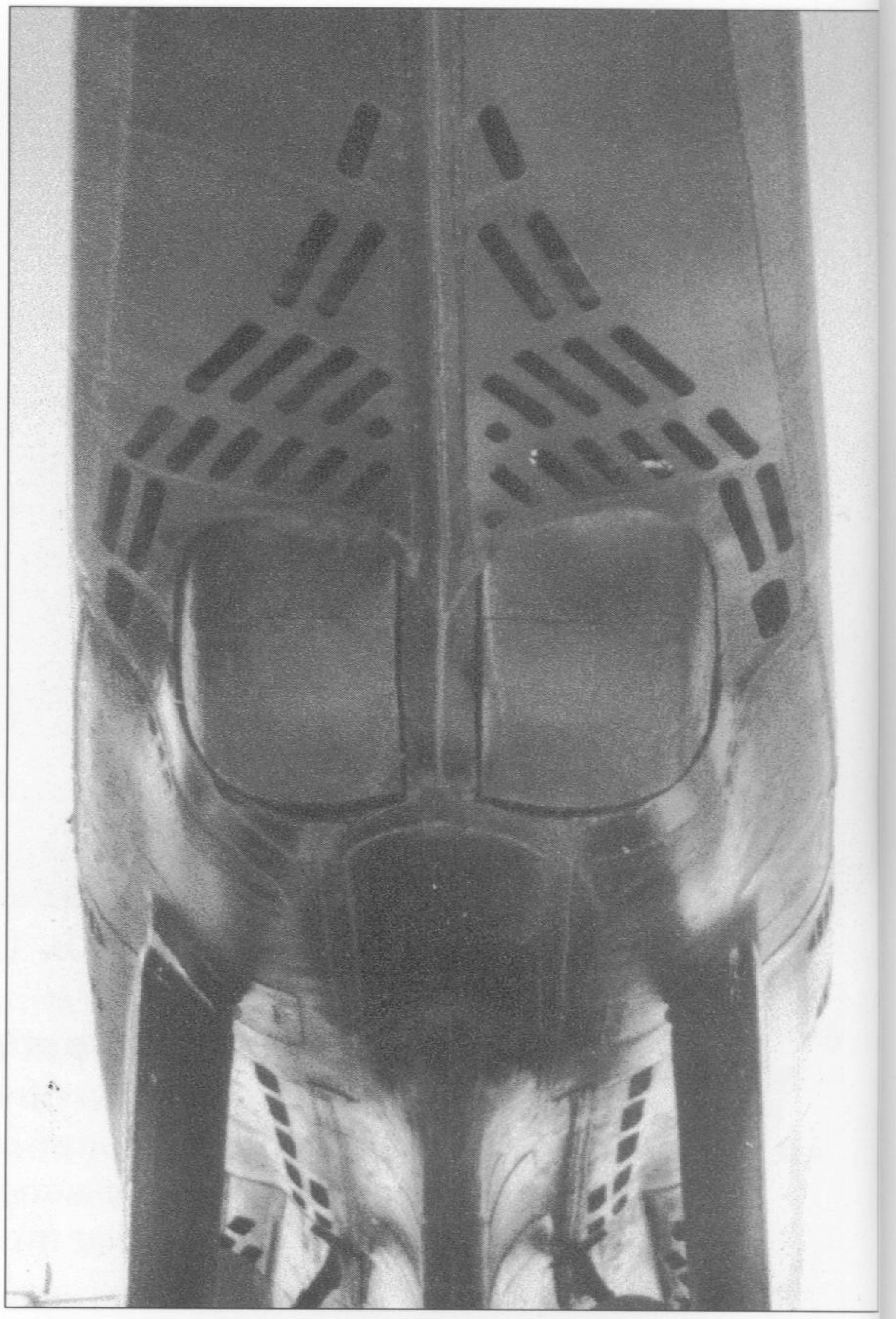
This mine was designed for dropping from a vertical mine shaft in specially designed minelaying boats rather than launching from the torpedo tubes. It was 2.15 metres in length and carried a 350-kilo charge. It could be used in waters up to 250 metres in depth.

ROCKETS

Some experimentation was carried out on the use of rockets from both surfaced and submerged submarines. Although successful tests were carried out, specifically on U-551, these were never used operationally. There was also a rather unusual plan to tow a V2 rocket, in a sealed container, within range of the USA, at which point tanks in the container would be flooded to turn it into a vertical position and the rocket launched. Rare photographs known to exist in the U-Boot Archiv show a U-boat towing what looks suspiciously like the proposed rocket container.

THE FOCKE-ACHGELIS

One particularly interesting, if not particularly effective, piece of equipment carried on most Type IXD boats after the summer of 1942 was the Focke-Achgelis rotary glider. Basically an unpowered helicopter with a triple-bladed rotor, it could be quickly disassembled and packed in a storage cylinder on the afterdeck. Once assembled, launching was easy, and the 'aircraft' was connected to the U-boat by an 'umbilical' cord. From his vantage point high above the submarine, the pilot could spot any targets, or approaching enemy ships, well before the bridge watch. Unfortunately, if the U-boat came under threat and there was no time to reel in the spotter, the umbilical cord would be cut as the U-boat dived and the unfortunate pilot left to his fate.



This photograph shows the two stern torpedo tube doors on the Type IX boats. The vents seen around the doors, and also further along the hull underside, lead to the free-flooding area between the external casing and pressure hull.

OTHER STANDARD EQUIPMENT

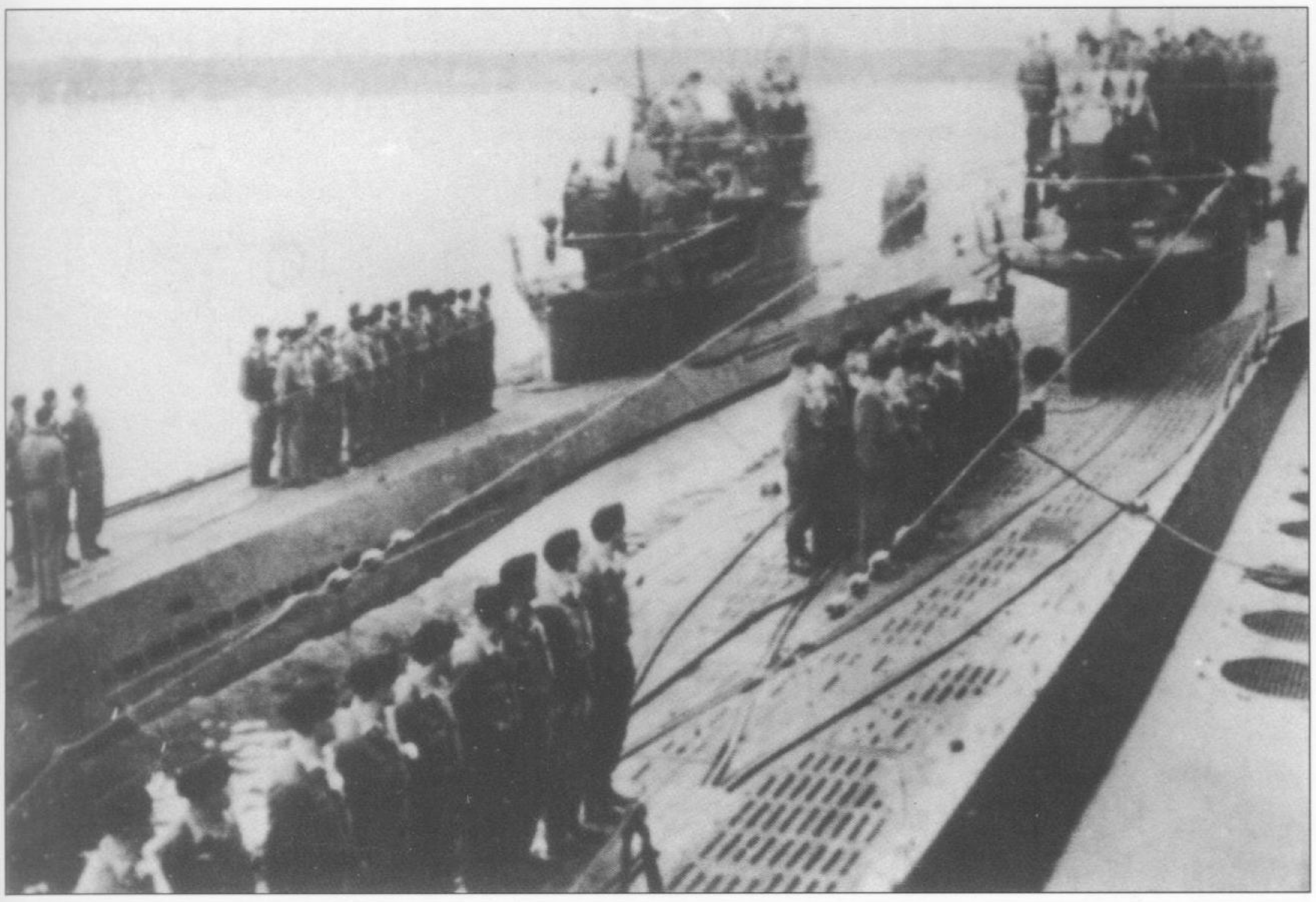
Radios

The standard method of communication between a U-boat and its shore-based command was the short-wave radio, operating on the 3–30 MHz range. Most U-boats were fitted with a combination of a Telefunken receiver, and a 200-watt Telefunken transmitter with a smaller 40-watt Lorenz transmitter as back-up. Once at sea, communication between U-boats utilised medium-wave radio on the 1.5–3 MHz range. Once again, the equipment was predominantly by Telefunken. Finally, signals sent to U-boats whilst submerged required the use of very long-wave signals on the 15–20 MHz range. These required an enormously powerful transmitter on land, but were the only sure way of making contact with a submerged boat. These signals were also received on the same Telefunken equipment as the medium-wave signals.

Radar

Basic radar equipment began to be installed on U-boats in 1940. The earliest operational type was the FuMO 29 (Funkmessortungs Gerät). This was predominantly used on the Type IX, but a few Type VIIs were also fitted with this equipment, easily detected on photographs because of the twin horizontal rows of eight dipoles on the upper front part of the conning tower. The top row were transmitters and the lower row receivers. An improved version, FuMO 30, was introduced in 1942 in which the tower-mounted dipoles were replaced by a so-called retractable

RIGHT **View towards the rear of the conning tower of a Type IXD, U-196. Of particular interest is the wooden mast in the centre of the tower. This is the so-called 'Biscay Cross', a primitive radar mast. Fragile, it was easily damaged but, because of its crudity, just as easily repaired. It had to be physically manhandled in and out of the submarine's interior each time it was used.**



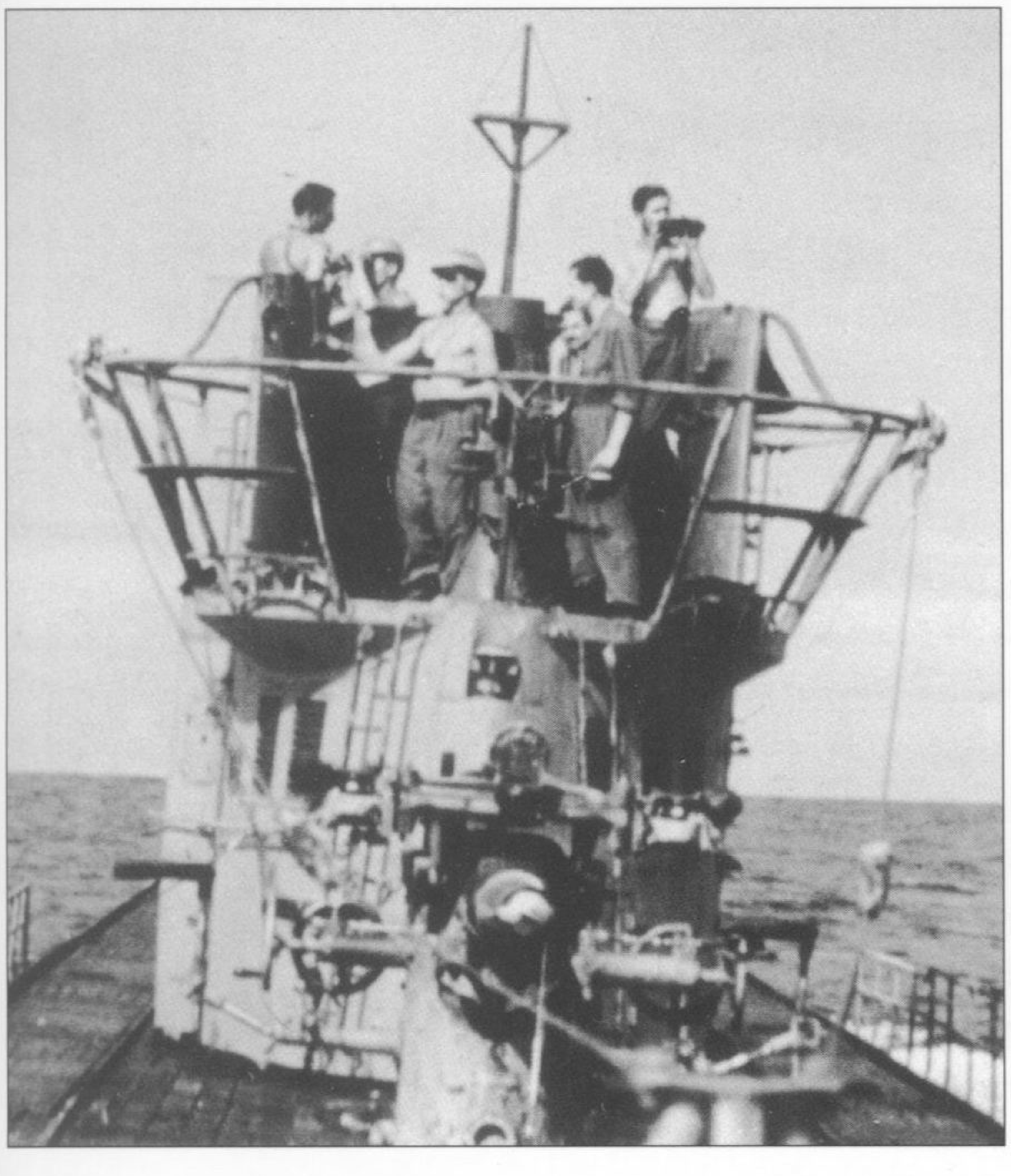
ABOVE **At right on this shot is U-219, a Type XB minelayer. Its large size is apparent by comparison to the Type IX lying alongside. Note the rails on the decking to allow movement of mines.**

'mattress' antenna which was housed in a slot in the tower wall.

This equipment was only partially successful in detecting other ships due to the very low position of its mounting in respect to the ocean surface (on surface ships, the radar is usually mounted high up on the mainmast or bridge top). Interference with the radar signal by the ocean surface in heavy weather meant that enemy ships might be detected visually before being picked up on radar. An improved version, the FuMO 61, was little better in this respect but did provide good aircraft detection results.

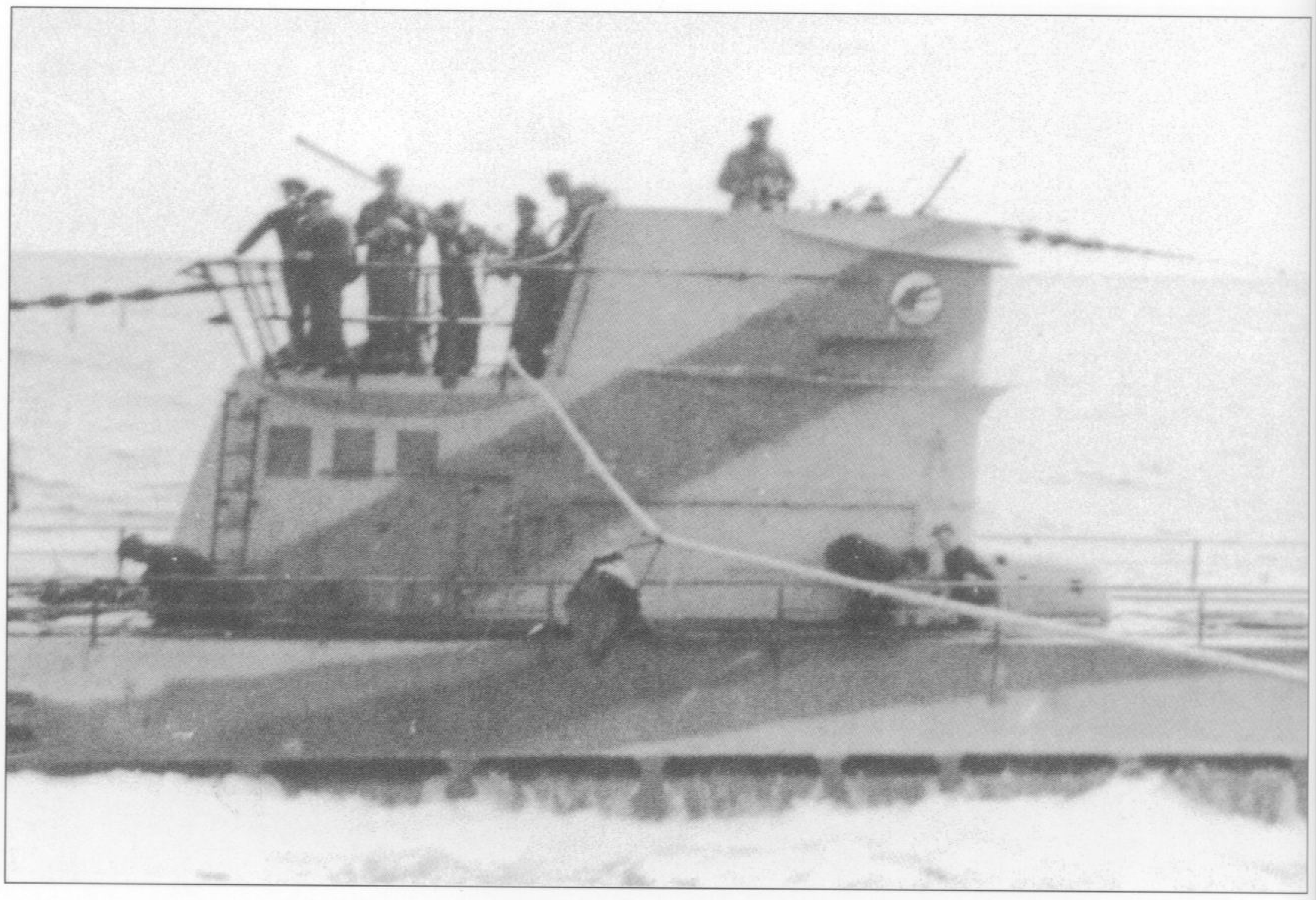
A new type of radar, the FuMB 1 (Funkmesserbeobachter), also known as Metox, was introduced in July 1942. This equipment was used in conjunction with an extremely crude wooden cross-shaped antenna strung with wire and known as the 'Biscay Cross'. This antenna had to be rotated by hand. Unfortunately, the Metox's own emissions were detectable by Allied radar detection equipment, leading them straight to the U-boat. A later, improved version, the FuMB 9 Zypern, was found also to be detectable by the British H2S radar detection system. Not until the FuMB 10 Borkum set did the U-boat have a radar detection system that was not itself detectable.

This still left the problem of the existing equipment not covering the full radar spectrum, a problem eventually solved in November 1943 by the FuMB 7 Naxos. Naxos and Metox used together finally gave the U-boats excellent all-round radar detection capabilities. The range of capabilities of Naxos and Metox were finally combined in a single system with the introduction of the FuMB 24 Fliege and FuMB 25 Mücke systems in April 1944.



Sound Detection

The earliest form of sound detection equipment used on U-boats was the Gruppenhorchgerät (GHG) installed in early vessels. The sound detectors were installed in the hull on either side of the bow, so that sound detection was only truly accurate when the boat was abeam of the vessel being detected. Improved sound detection came with the Kristalldrehbasis Gerät (KDB) in which the sound detection array was contained in a rotating, retractable mount set into the foredeck. This was the system carried on most Type VII vessels. A number of U-boats were also equipped with the so-called Balcon Gerät (Balcony Apparatus) set into a 'balcony'-shaped faring in the lower part of the bow. This gave a far better effective field than either the GHG or KDB systems.



This is U-504, a Type IXC showing the early 'Turm 0' conning tower configuration with single platform. Note the unusual two-tone light/dark grey disruptive camouflage scheme.

Alberich

An ingenious defensive measure for U-boats was the creation of Alberich. This was a synthetic rubber sheeting that was to be glued to the hull of the U-boat and which would absorb sound, thus making Allied sonar equipment much less efficient at detecting submerged vessels. Initially, considerable problems were encountered in producing an effective adhesive, with the result that the rubber sheeting would loosen and create turbulence in the water as the submarine moved along, making it easier rather than more difficult to detect. The theory was sound, however, and once an effective adhesive had been produced further tests were made that showed the system to be extremely effective. Only a very few U-boats were coated in Alberich, though it had been the intention that it would be widely used on the new Type XXI and Type XXIII boats. However, the war ended before it could be put into large-scale use.

Bold

Bold was a fairly effective countermeasure against enemy escort ships. It was a simple device consisting of a metal canister packed with calcium hydride, with an inlet valve to admit water. When launched, sea water would enter the canister and react with the calcium hydride, releasing a dense volume of air bubbles. The canister was designed to hover at around 30 metres deep. The result would give a sonar 'signature' very similar to the U-boat itself. Its purpose was to attract the attention of the escorts whilst the U-boat itself quietly slipped away unnoticed.

Aphrodite

This simple device was merely a large (one metre diameter) hydrogen-filled balloon from which dangled strips of metal foil. It was attached to a cable with an anchor weight. Its purpose was to create a radar image similar to that of the U-boat. A U-boat travelling on the surface at night could release a number of such devices in the hope that Allied aircraft in the vicinity would home in on the stronger radar signals bounced back by these, giving the U-boat itself time to escape.

THE TYPE X

Broadly analogous to the large ocean-going UE (U-117) Class minelayers of the Kaiserliche Marine, the Type X was produced specifically to handle the newly developed Sonderminen A or SMA, anchored mine. The initial design, the Type X, was to provide dry storage for its complement of SMA mines, which required the detonators to be individually, manually adjusted prior to launch, so that wet storage was impossible. This boat was projected to have displaced up to 2,500 tons, therefore a very large vessel indeed. A further variant, the Type XA, was projected, in which the main mine chamber would be supplemented by additional mine shafts in the saddle tanks. In the event, neither type was ever produced.

THE TYPE XB

A total of eight boats of the Type XB Class were produced, the mine chamber of the Type XIXA projected designs being replaced by six vertical wet storage shafts in the forward part of the hull. The boat could carry up to 18 mines in these shafts (three per shaft) plus an additional 48 mines (two per shaft) in a series of twelve shafts set into the saddle tanks on each side – six just forward and six aft of the conning tower position. The Type XBs were large boats, with a very distinctive narrowing of the foredeck between the bow and conning tower area, designed to help speed up the boat's diving time.

SPECIFICATIONS

Length	89.8 m
Beam	9.2 m
Draft	4.7 m
Displacement	1,763 tons surfaced, 2,177 tons submerged
Top Speed	16.4 knots surfaced, 7 knots submerged
Endurance	14,450 nautical miles surfaced, 188 nautical miles submerged
Powerplant	2 x Germaniawerft 9-cylinder supercharged 2,100 bhp diesels, 2 x AEG 550 bhp electric motors
Armament	2 x 2 cm flak guns on upper conning tower platform 1 x 3.7 cm flak gun on lower platform 66 mines carried 2 stern torpedo tubes 5 torpedoes carried
Crew	52

Construction Details

Germaniawerft, Kiel

U-116 to U-119	4 boats
U-219 to U-220	2 boats
U-233 to U-234	2 boats
Total for type	8 boats

Of the eight boats produced, six (U-116, U-117, U-118, U-119, U-220 and U-233) were sunk by enemy action. Of the 312 crewmen this represents, 45 survived the sinkings.

This action photograph, taken during a war patrol, shows U-130, a Type IXC, in heavy seas. One can easily imagine the difficulty the gun crew would have had in keeping their footing on the heaving deck. Note the seawater pouring from the vents leading to the free-flooding area between the outer casing and pressure hull.

U-219 was docked in Jakarta, Malaysia, when Germany surrendered and was subsequently seized and used by the Imperial Japanese Navy. The most interesting Type XB of all, and one of the most interesting of all the U-boats, was U-234. This boat was en route to Japan at the war's end, carrying a number of high-ranking military and scientific staff, two Japanese officers, 260 tons of cargo, secret blueprints for advanced weapons, and containers of uranium oxide probably for use in atomic research. On hearing of the German surrender and orders for U-boats to give themselves up to the Allies, the Japanese officers committed suicide. U-234 was snatched by the Americans, who spirited away the uranium oxide in considerable secrecy. Much of the information regarding this boat and its fascinating final journey is still shrouded in mystery.

Given the large number of U-boats which never sank a single enemy ship, the Type XB was not unsuccessful as a class, but many of the class did achieve some successes sinking or damaging enemy ships with both torpedoes and mines.

U-116	One enemy ship sunk (4,300 tons) and one damaged.
U-117	No enemy ships sunk, but two damaged by mines.
U-118	Three enemy merchants sunk (14,000 tons total), one enemy corvette sunk, three enemy ships damaged.
U-119	One enemy ship sunk (2,940 tons) and one damaged, both by mines.
U-219	No enemy ships sunk.
U-220	Two enemy ships sunk (7,200 tons total).
U-233	No enemy ships sunk.
U-234	No enemy ships sunk.

THE TYPE XXI

Of the boats previously used by any navy, none could be considered a true 'submarine'. In effect, all were simply submersible boats. None was capable of remaining submerged for a significant length of time due to the extremely limited life of the batteries used to power the boat when submerged. All early submarines had to surface to run the main diesel engines in order to recharge their batteries and replenish their compressed air supplies before diving again, and all suffered from severely reduced speed when submerged. In most cases, submarines had to position themselves carefully to allow the target to pass by them in order to achieve the optimum firing position for their torpedoes. The

A: Early Type IX models

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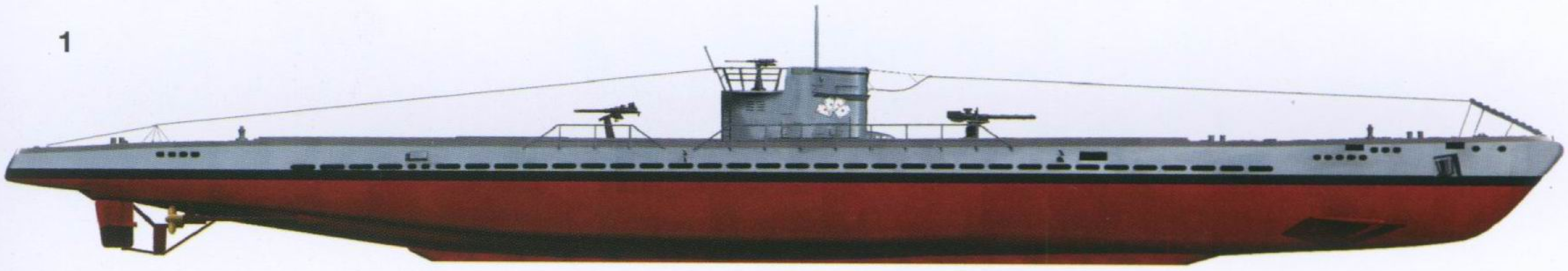

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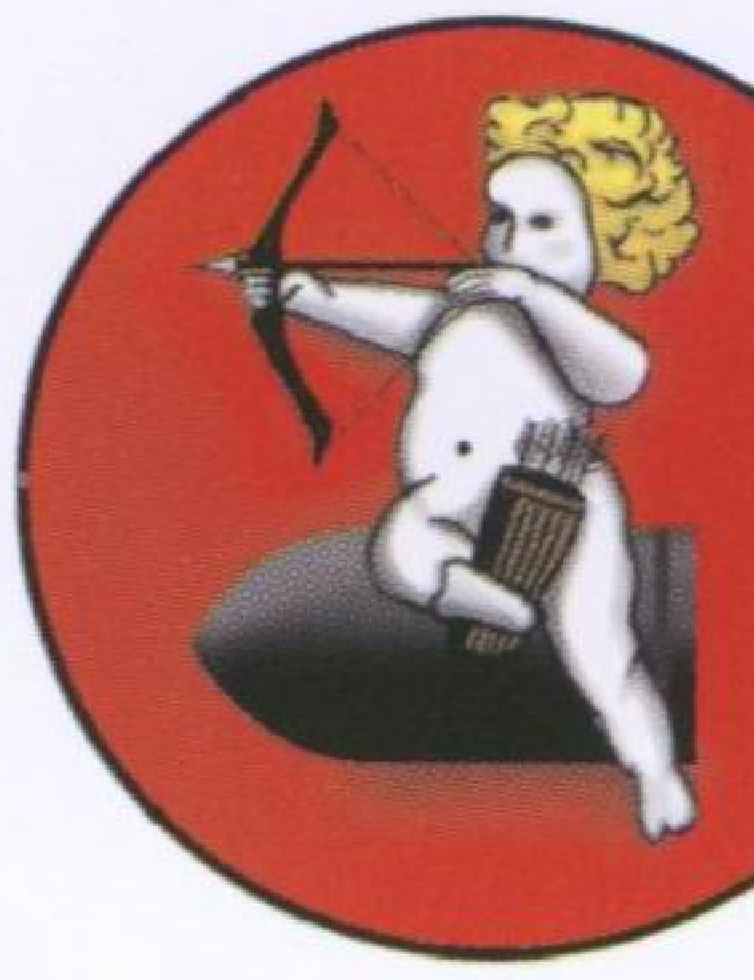

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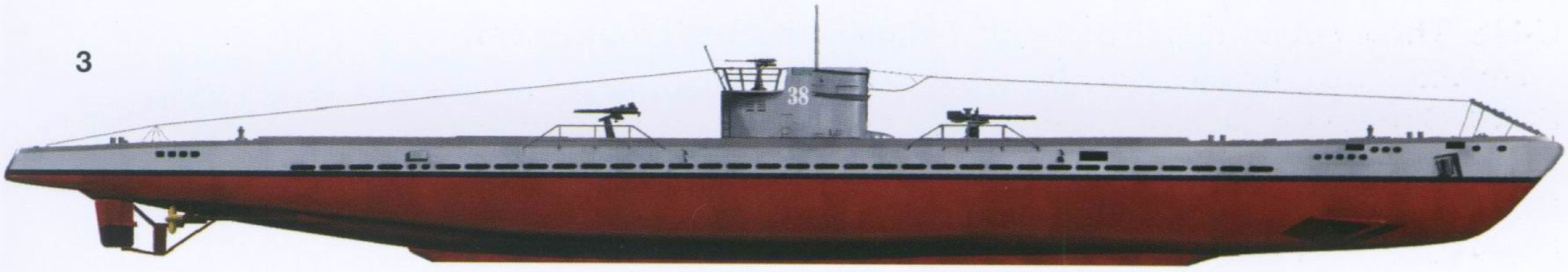

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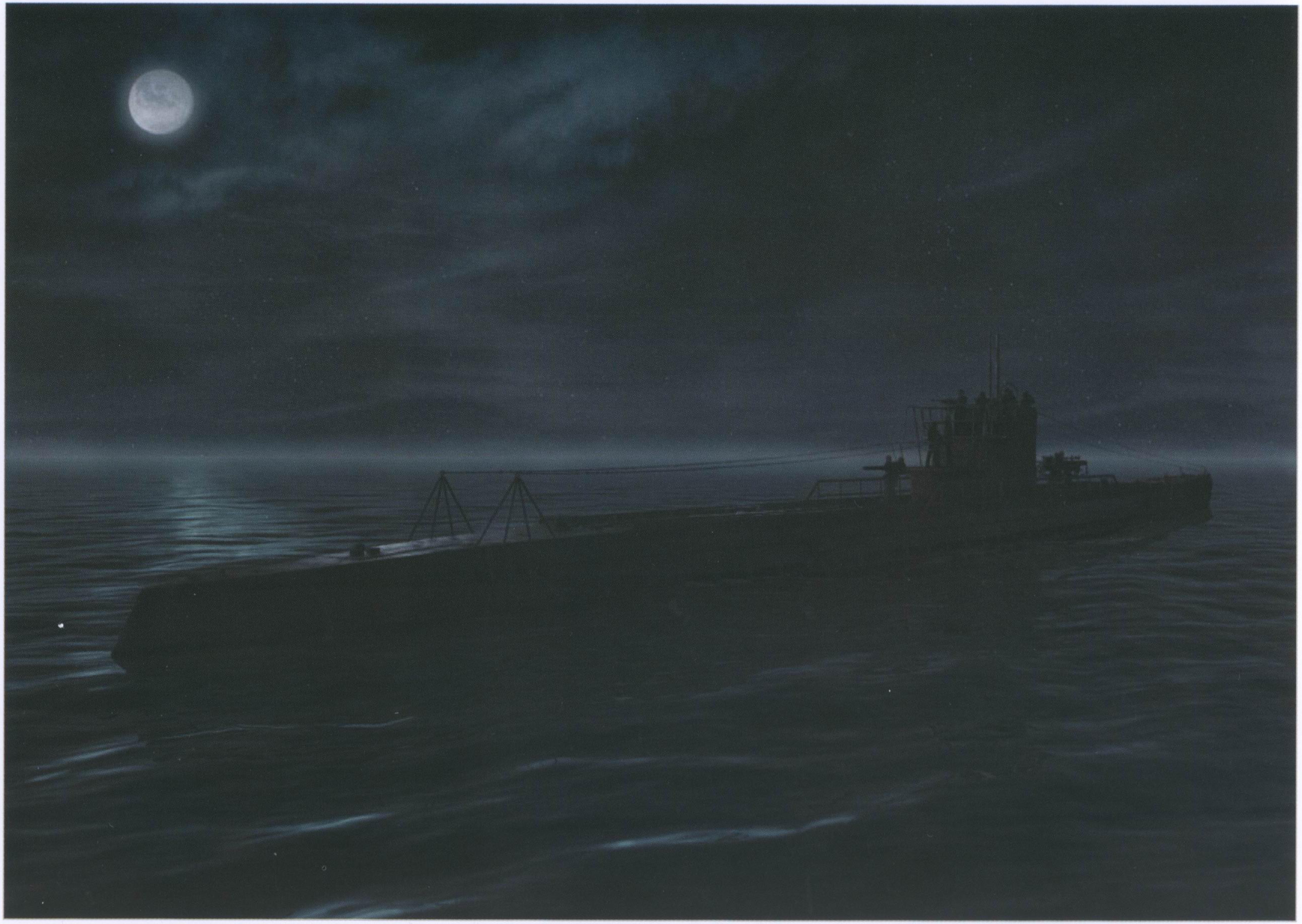

B: A Type IXD recharging her batteries

C: Type XXI and XXIII U-boats

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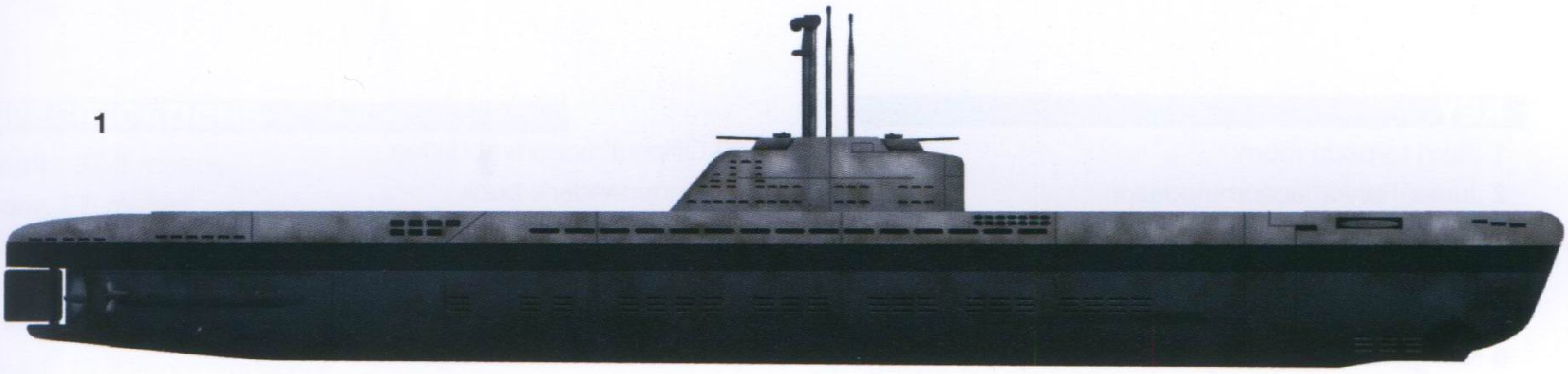

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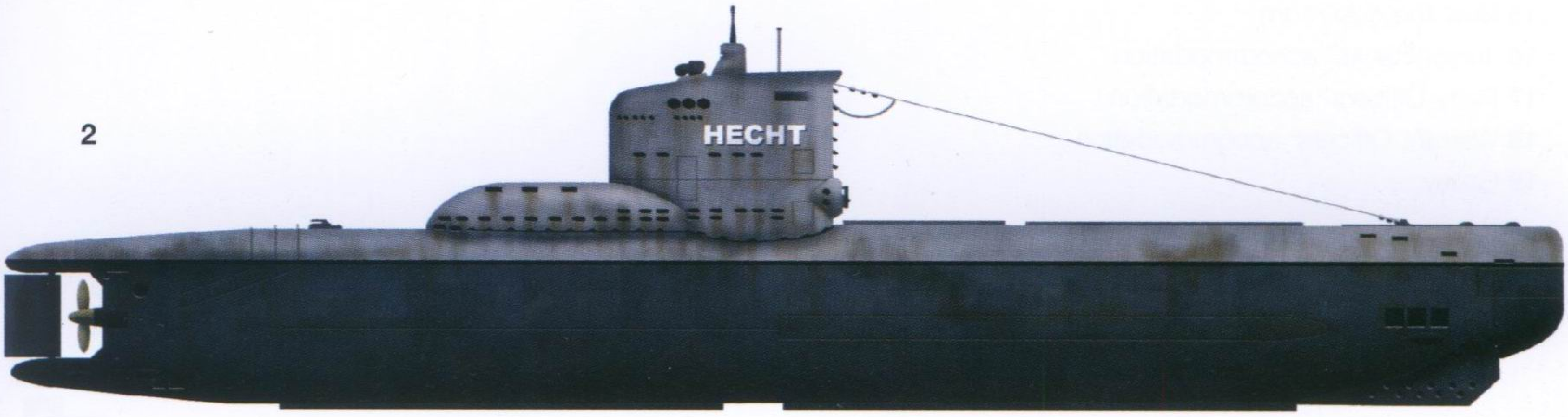

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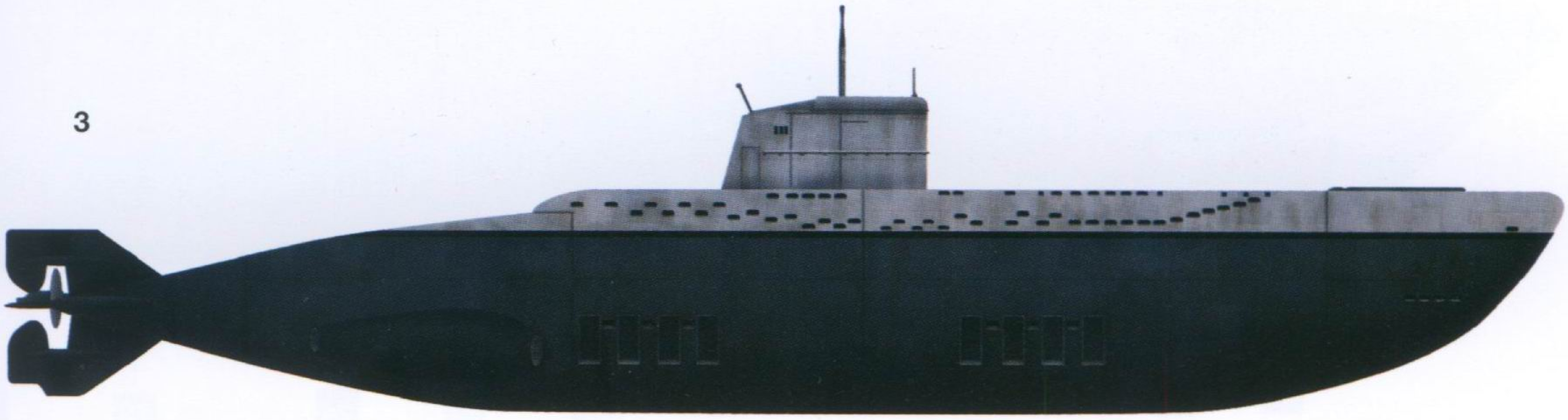
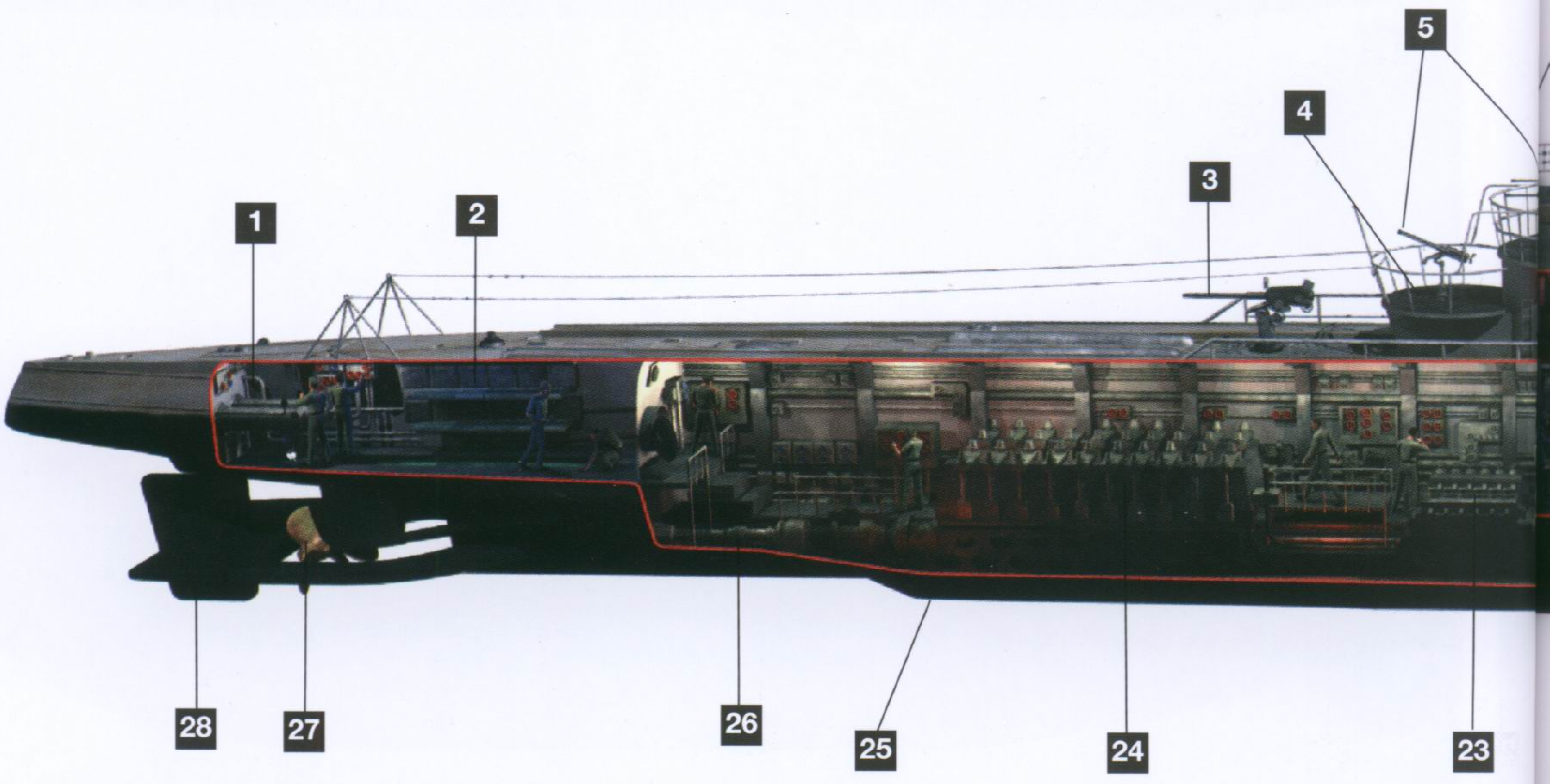


D: INTERIOR LAYOUT OF A TYPE IX

KEY

1 Stern torpedo room
2 Junior Ranks' accommodation
3 3.7 cm flak gun
4 'Wintergarden' platform
5 2 cm flak guns
6 Navigation periscope
7 Attack periscope
8 Radar
9 Conning tower
10 Commander's attack position
11 10.5 cm deck gun
12 Retractable bollards
13 W.C.
14 Retractable capstan
15 Bow torpedo room
16 Junior Ranks' accommodation
17 Petty Officers' accommodation
18 Warrant Officers' accommodation
19 Galley
20 Officers' accommodation
21 Commander's bunk
22 Control room
23 Electro-motors
24 Diesel engines
25 Keel
26 Propeller shaft
27 Propellers
28 Rudders



SPECIFICATIONS

Length: 87.6 metres

Beam: 7.5 metres

Draught: 5.4 metres

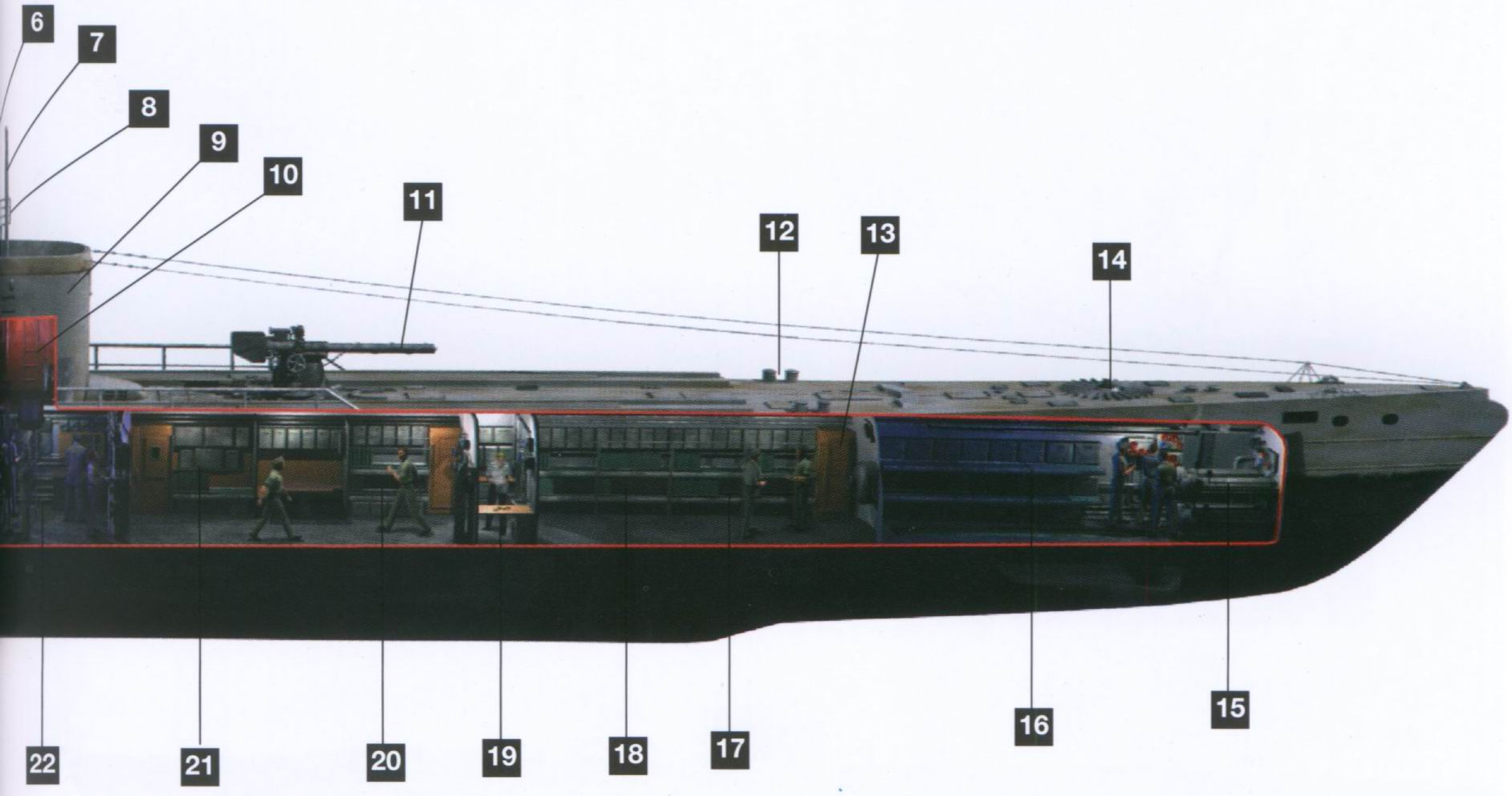
Displacement: 1,616 tons (surfaced)
1,804 tons (submerged)

Speed: 19.2 knots (surfaced)
6.9 knots (submerged)

Range: 22,400 miles (surfaced)
12 miles (submerged)

Crew: 57 men

Armament: 1 x 10.5 cm deck gun
1 x 3.7 cm flak gun
3 x 2 cm flak guns
24 torpedoes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E: Type IX variants and the XB Minelayer

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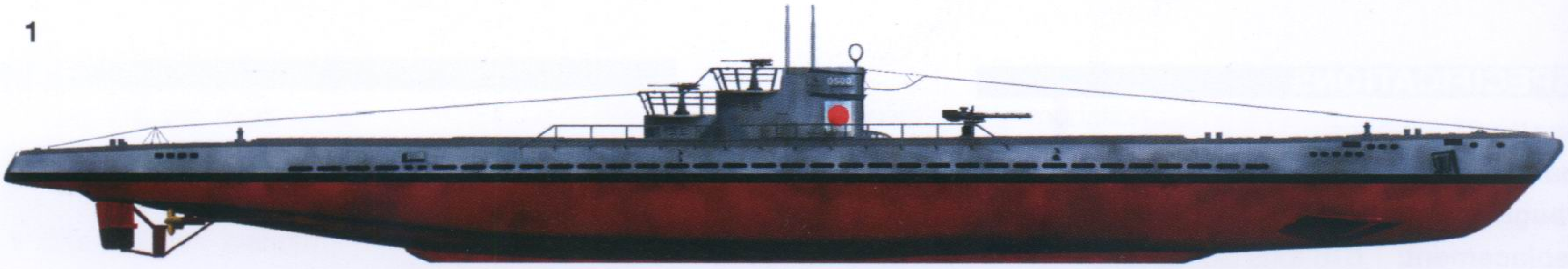

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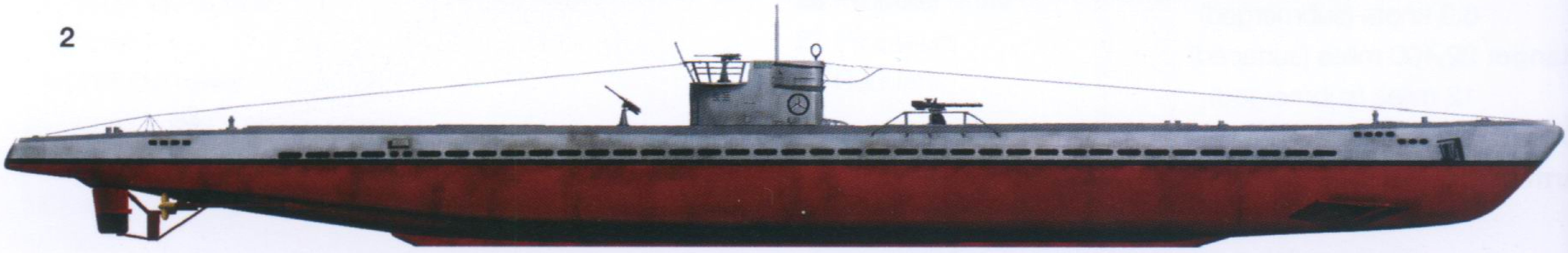

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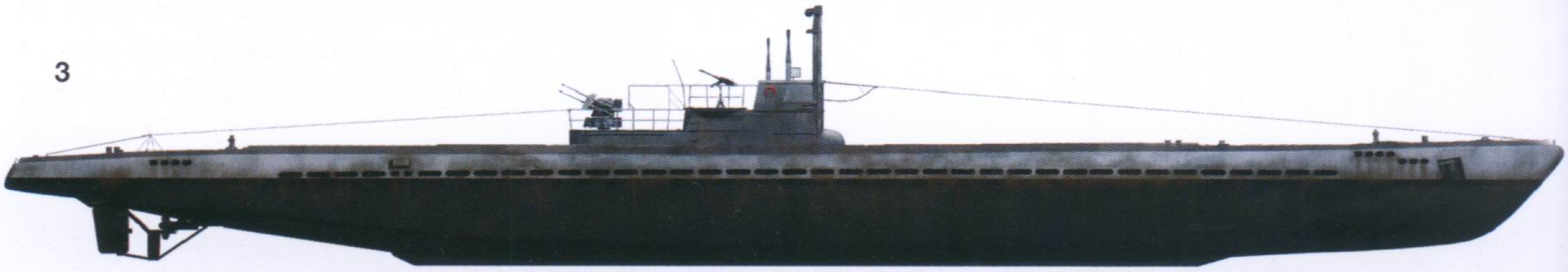

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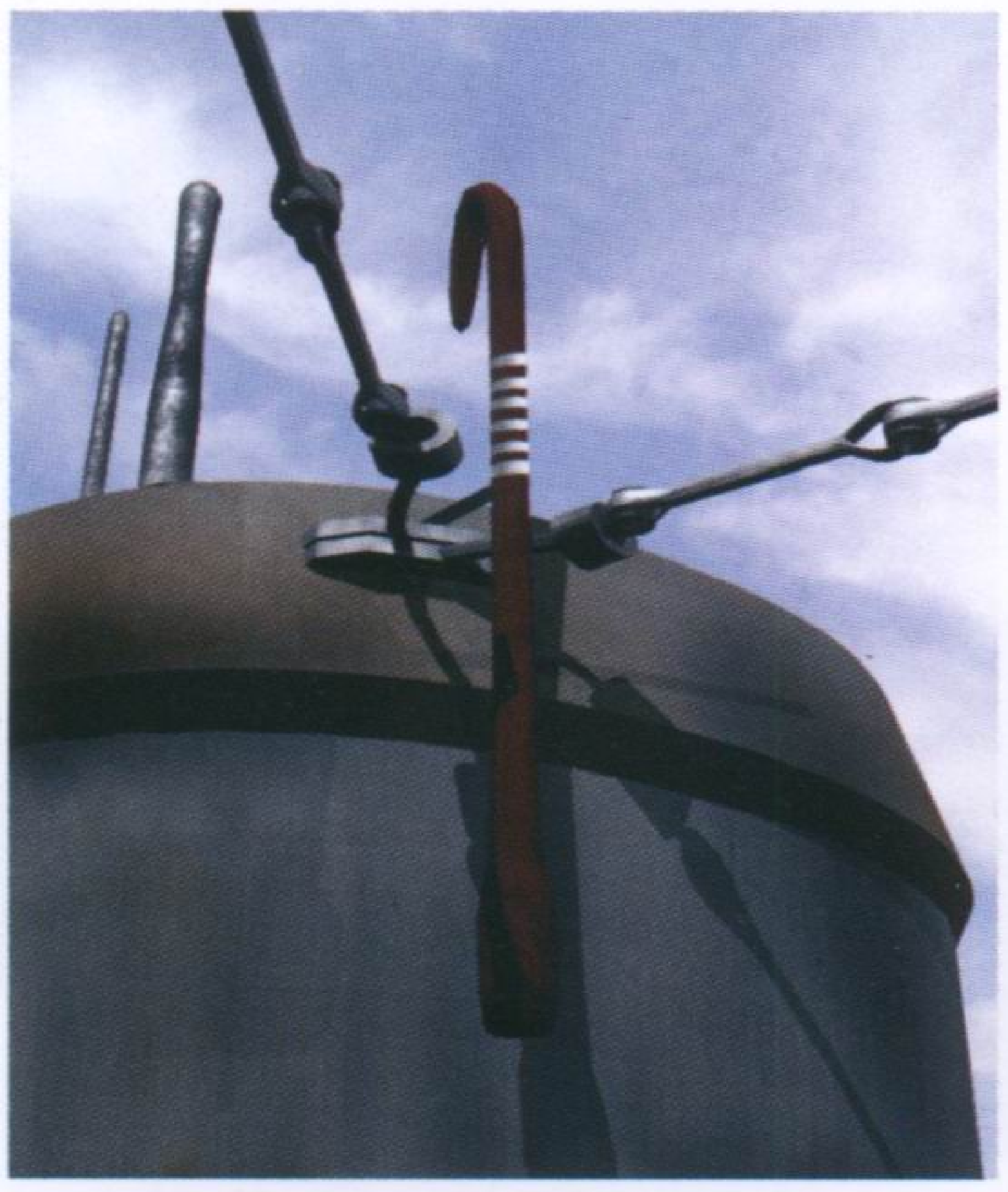

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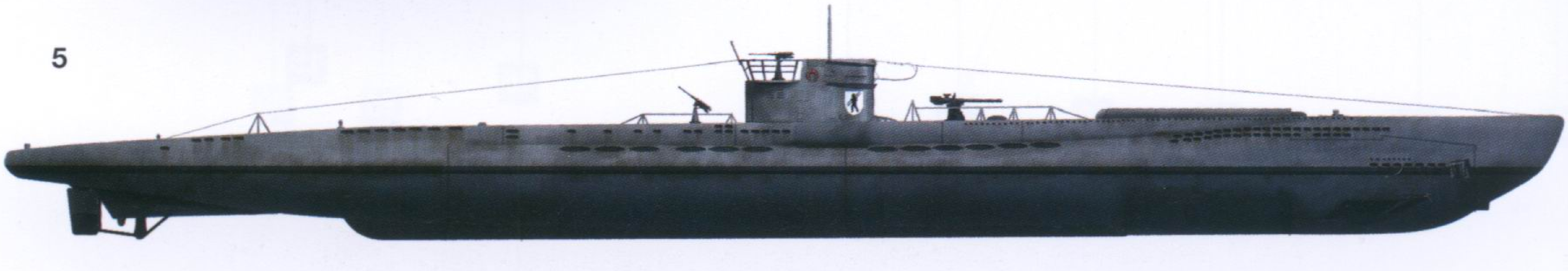

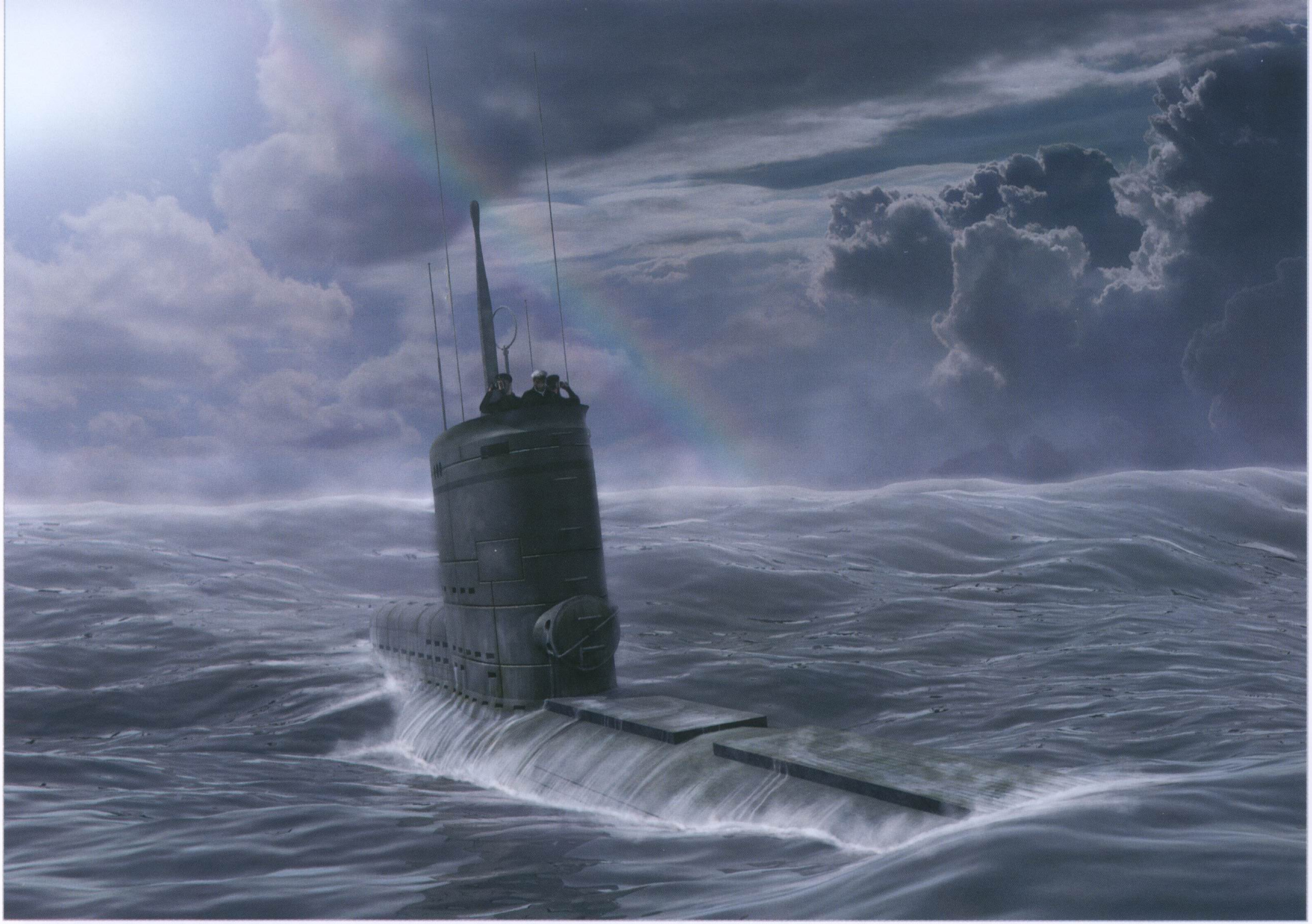

F: The Type XXIII U-2336

G: Midget Submarines

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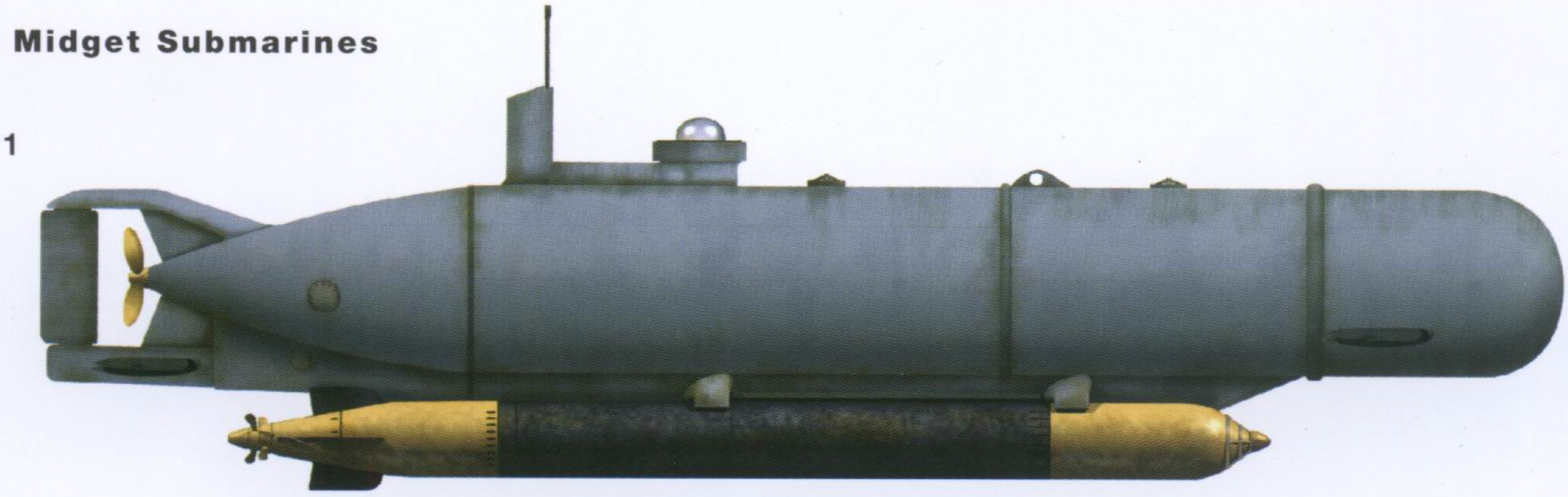

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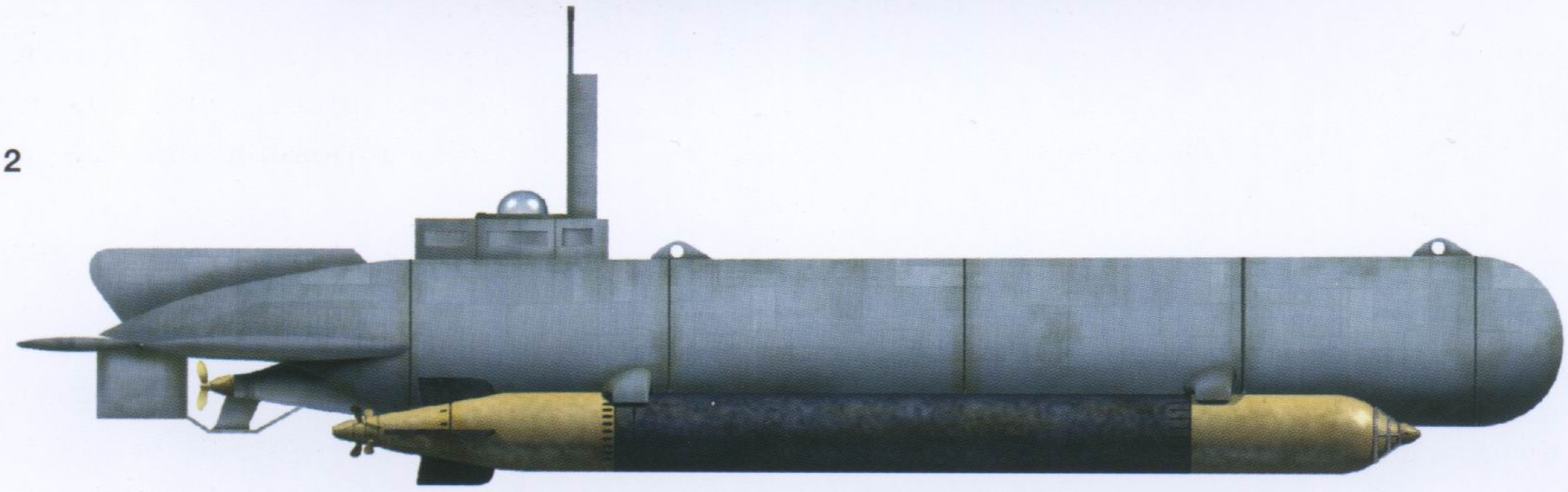

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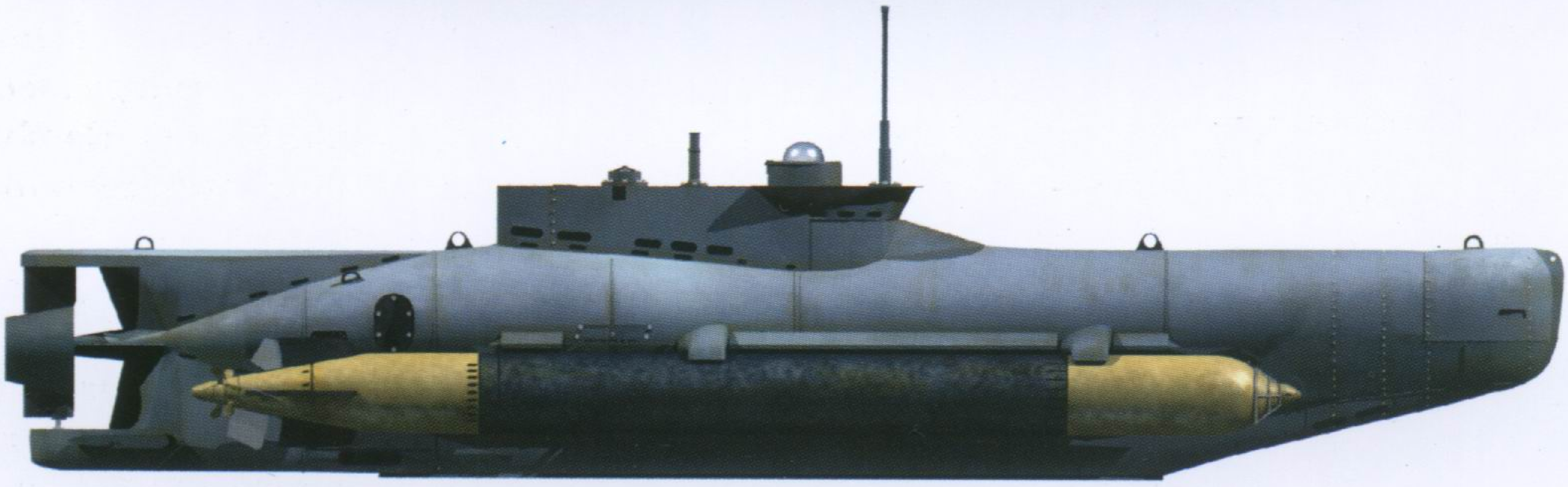

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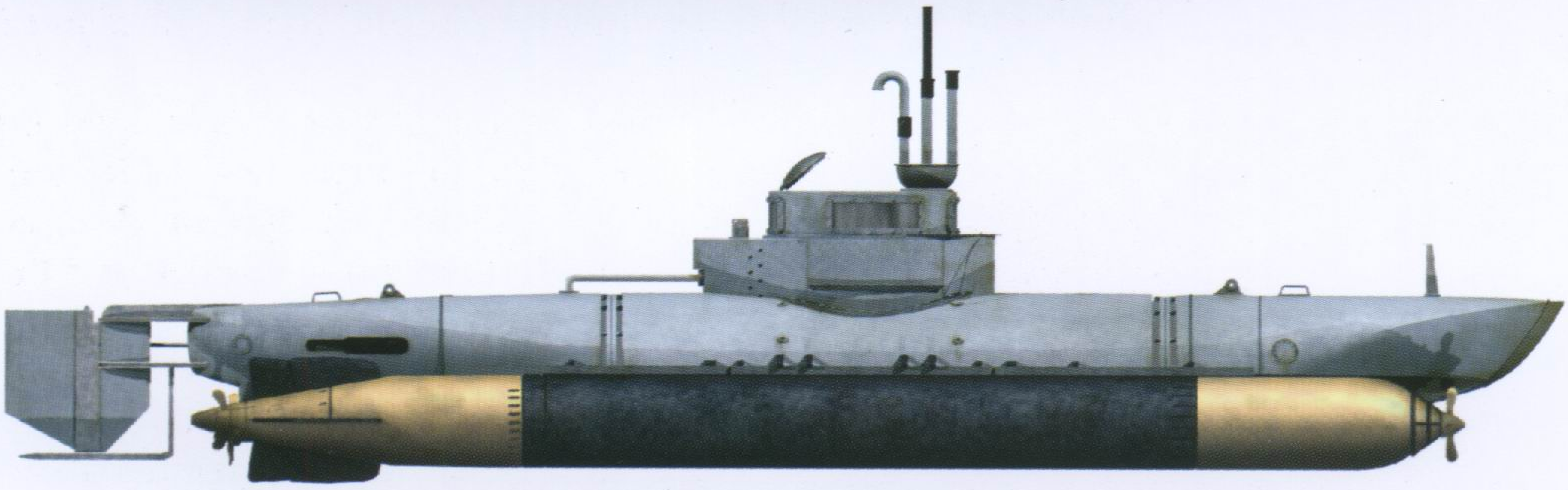

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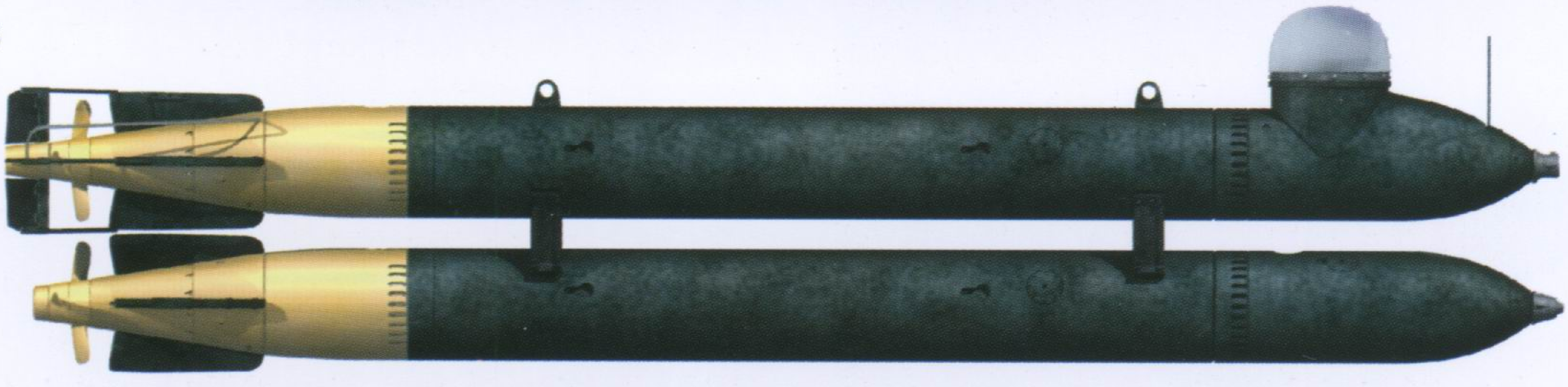
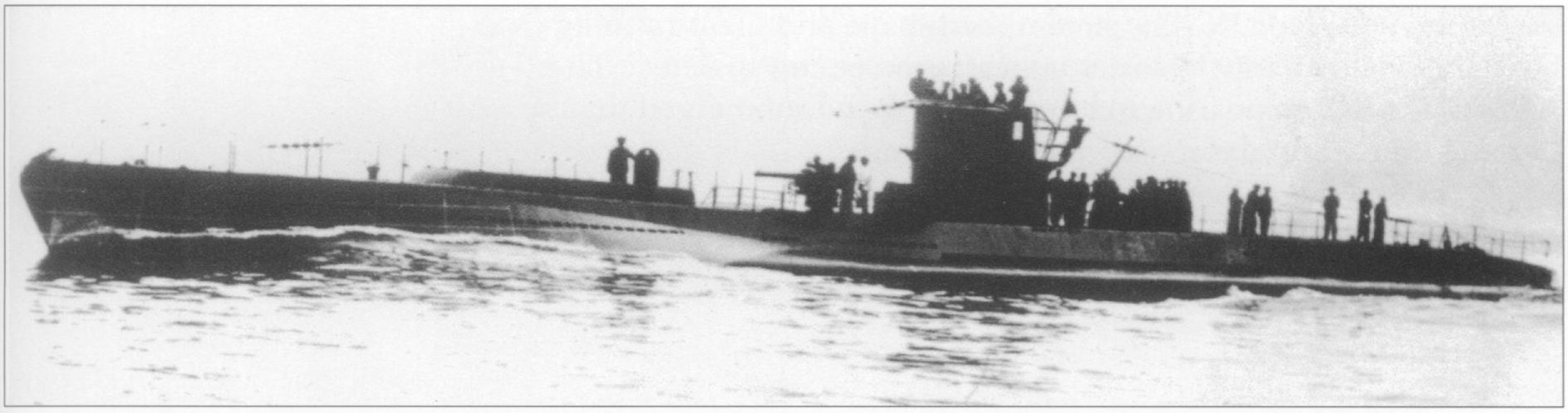




ABOVE **A further shot of U-219, this time at sea. Note the distinctive raised casing on the foredeck, enclosing the top of the forward mine shafts. Mine shafts were also let into the saddle tanks on either side of the hull. This particular boat, under Korvettenkapitän Walter Burghagen, was operating in Far Eastern waters at the end of the war in Europe and was subsequently taken over by the Japanese as the I 505.**

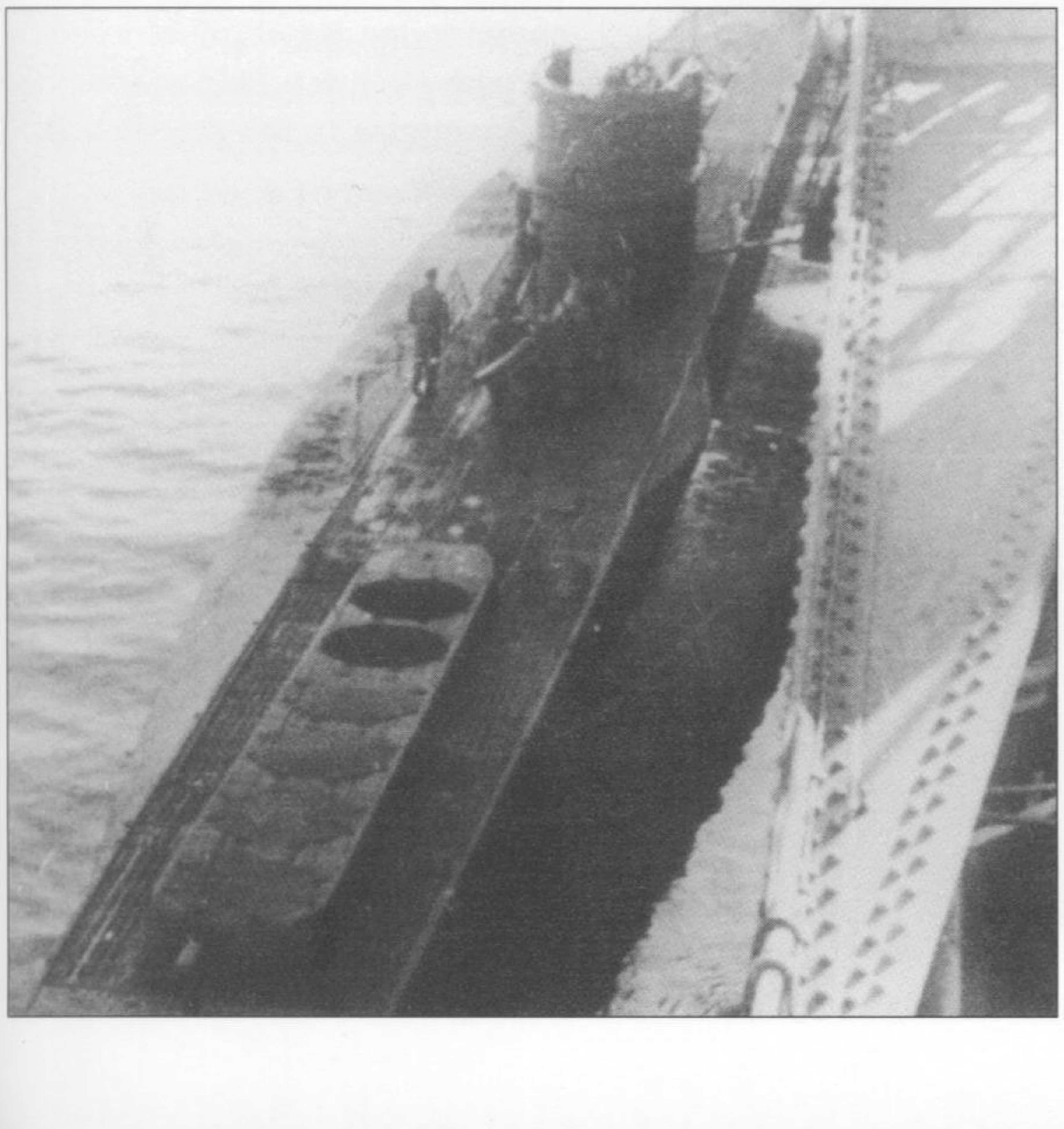
BELOW **The Type XB minelayer, U-117, gives a good idea of the sheer bulk of these boats. The first two mine shafts on the foredeck are open. The circular covers over the mine shafts on the saddle tanks can just be discerned. This boat carried out nine patrols but was eventually sunk off the Azores in August 1943.**

speed of most surface vessels exceeded that of a submerged submarine. In fact, the speed of many vessels on the surface exceeded the top speed of a submarine running on its main diesel engines. Once a target had slipped past a submarine, it would often be impossible to catch up with the intended victim.

With the advent of the Type XXI, the Germans had made a quantum leap in submarine design and manufacture. This amazing vessel was the first to be mass-produced in modular form. In order to take advantage of manufacturing capacity throughout the Reich, actual manufacture of components and of these components into sub-assemblies was carried out in various parts of Germany, often well inland rather than at traditional coastal shipbuilding locations. Sections of hull were fabricated, had internal components fitted and were even painted, before being transported to assembly yards at Blohm & Voss, Hamburg, AG Weser, Bremen and Schichau at Danzig. At these yards, the various hull sections were carefully aligned and welded together.

The theoretical total build-time for a Type XXI was estimated at 176 days.

The Type XXI was fully streamlined, with no extraneous external fittings to produce unwanted drag. All periscopes, snorkel pipes, radar masts etc. were fully retractable, and even the flak guns were built into streamlined rotating turrets and the forward and rear edges of the tower.



The design had originally been intended to accept a revolutionary new hydrogen peroxide powered propulsion system designed by Dr Helmuth Walter, but it was decided that the new boat could equally well be adapted to use diesel engines. The large, roomy hull, which had all of its six torpedo tubes mounted in the bows, could take a much larger complement of batteries to power its vastly improved electric motors, greatly improving its underwater endurance. As well as new and extremely powerful turbo-supercharged diesel engines, the Type XXI was provided with a special 'creep' motor to allow silent running, and a whole host of improved electrical gear.

The Type XXI could achieve a top speed of 17 knots submerged, more than double that of the Type IX, and could run under water on its batteries for up to 75 hours, around 50 per cent longer than the Type IX. The streamlined shape and silent running capability also made it a much harder target for the enemy to detect. The Type XXI was the first submarine to have a faster speed submerged than when running on the surface.

SPECIFICATIONS

Length	76.7 m
Beam	6.6 m
Draft	6.3 m
Displacement	1,621 tons surfaced, 1,819 tons submerged
Top Speed	15.6 knots surfaced, 17 knots submerged
Endurance	11,150 nautical miles surfaced, 285 nautical miles submerged
Powerplant	2 x MAN turbo-supercharged 2,200 bhp diesels 2 x SSW 2,500 bhp electric motors 2 x SSW 320 bhp 'creep' motors
Armament	2 x twin 2 cm turret-mounted flak guns on conning tower 6 bow torpedo tubes 23 torpedoes carried
Crew	57

Internal Description

There were several significant differences in the internal layout of the Type XXI as compared to the Type IX, not the least of which was the greater amount of space. The hull of the Type XXI was, as stated, of modular construction, made up of nine separate units: the stern section containing the W.C. and workshop, the electric motor room, the diesel motor room, the aft crew accommodation, the control room, the forward accommodation, the torpedo storage area, the bow cap with torpedo tubes and the conning tower unit.

Beginning at the bow end, the bow cap was pierced by six torpedo tubes rather than the four common to most previous types. Immediately abaft of this was the torpedo storage area containing the boat's payload of torpedoes. Then followed the forward crew accommodation area. This was much roomier than on previous types. On most other models, a central walkway separated two rows of bunks attached to the interior hull side. On the Type XXI, however, a double row of bunks separated by a further narrow walkway was set up on the port side, whilst to starboard was the forward W.C. and to the rear of this, accommodation for the three ship's officers.

Moving aft, the second part of this section had, once again to port, a double row of bunks separated by a narrow walkway, accommodating the senior non-commissioned ranks, whilst to starboard was the chief engineer's quarters – a fairly spacious sleeping accommodation/office.

One of the war's most controversial boats was U-234. She was at sea en route to Japan with a secret cargo including, amongst other things, a supply of uranium, and some high-ranking German and Japanese officers when the war ended. The two Japanese on board committed suicide when they learned that the commander, Kapitänleutnant Johann-Heinrich Fehler, intended to surrender to the Americans.

An officer from U-3022, a Type XXI, on the afterdeck. These boats were intended to spend most of their time under water, so no extensive deckworks were provided, just a narrow central walkway seen to good effect here.

Moving aft again, on the port side was the commander's cabin, which was much more spacious than on earlier boats. Directly across the central walkway was the radio/sound room. The heart of the boat was the control room or *Zentral* that, as on most boats, contained the diving plane controls, main switchboard, navigator's table, periscope controls etc.

Aft of the control room was the food preparation area. To port was the galley itself with its electric cooker, whilst on the starboard was the pantry, which boasted a freezer compartment to keep fresh foods from rotting in the damp, humid atmosphere.

Abaft this area was the main crew accommodation. To both port and starboard of the main walkway were double rows of bunks, each separated by a further narrow walkway. The twelve bunks provided on each side could accommodate a maximum of 48 men, using the 'hot-bunking' system, where two men shared a bunk, one occupying it whilst the other was on watch.

Next came the main diesel motor room with one of the huge MAN turbo-charged diesels either side of the central walkway. This was followed by the electric motor room with, on each side, a 2,500 bhp electric motor and 320 bhp 'creep' motor coupled to each shaft.

There were no stern torpedo tubes on the Type XXI. The stern compartment featured the stern W.C. to starboard and, to port, a small workshop area provided with a lathe to allow repair work to be undertaken.

Most of the space available under the floor plates of the Type XXI was taken up with storage for the boat's large complement of batteries.

The Type XXI, externally, was highly streamlined with no bulging saddle tanks, no deck armament and all bridge works contained in a single hydrodynamic tower to reduce drag. On both forward and aft ends of the tower were located twin 2 cm flak guns, in streamlined turrets. Periscopes, snorkel and Hohentweil radar array could be retracted into special housings. Everything possible was done to reduce drag and thus increase underwater speed.

On the underside of the bow, the Type XXI was equipped with a sonar array known as GHG or Gruppenhörchgerät. This provided a basic all-round listening device. On the front face of the tower a further active sonar array was installed, the Nibelung SU(R), which provided direction/range-finding capabilities. The combination of this equipment allowed the Type XXI commander to detect enemy ships, estimate their range and course and launch his torpedoes all without recourse to the use of the periscope and the risk of the betrayal of his position that periscope use entailed.

Construction Details

Blohm & Voss, Hamburg	
U-2501 to U-2552	52 boats
Deschimag, Bremen	
U-3001 to U-3051	51 boats
Schichauwerft, Danzig	
U-3501 to U-3530	30 boats
Total	133 boats

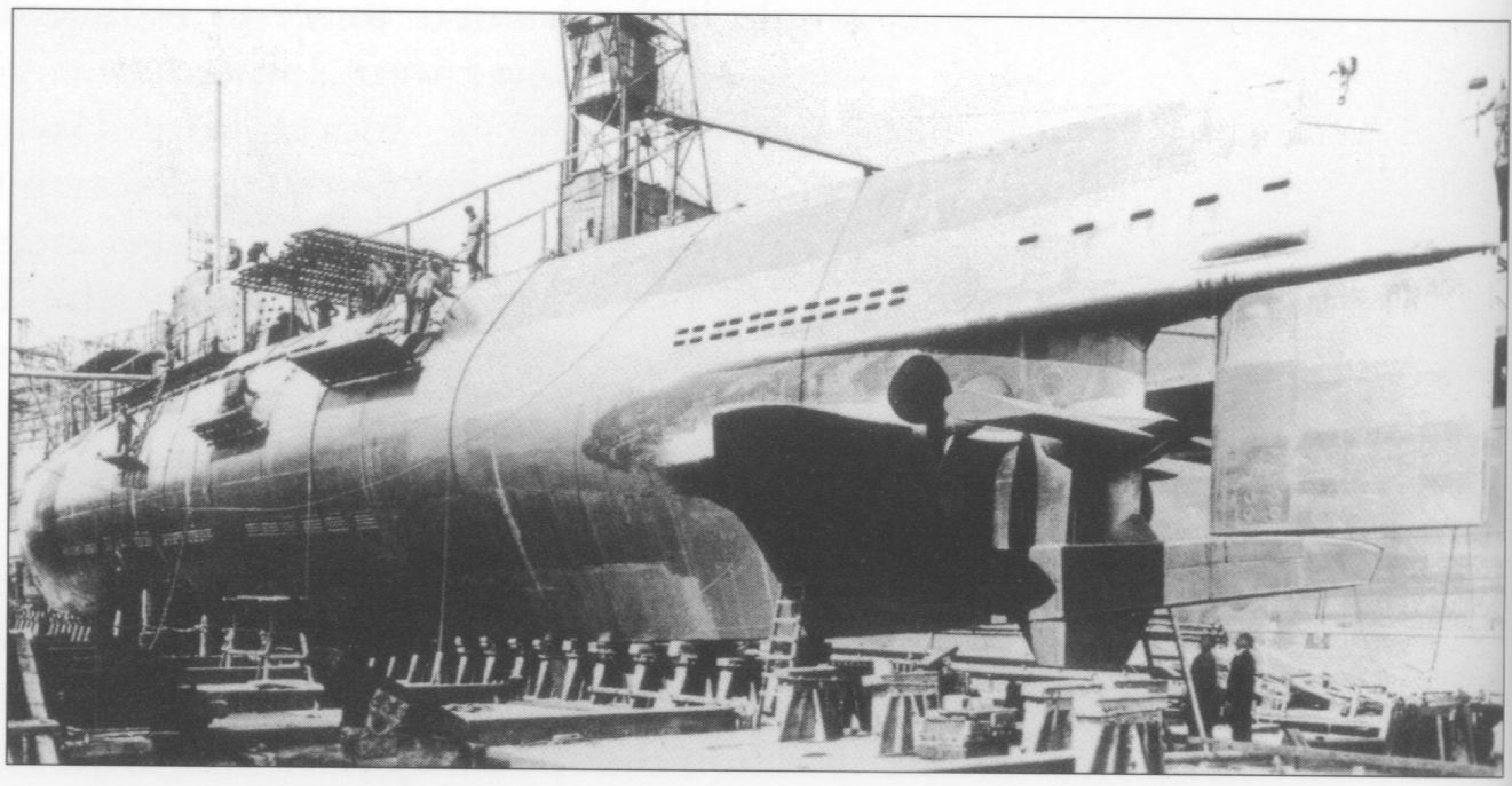
Operational Use

Although the Type XXI concept was excellent, and far ahead of its time, as with all new technology, there were teething troubles, and not everything ran smoothly. Build quality of some of the sub-assemblies was not always good and many problems did not come to light until the boats were tested after final assembly. Then many had to have remedial work carried out to make them fit for service. In addition, the constant attention given to the assembly area by Allied bombing raids caused considerable disruption.

With the Type XXI being entirely new, even experienced U-boat crews had to be trained almost from scratch. A total of 133 Type XXIs were built, of which only two carried out war patrols. In both cases, the order to cease hostilities came before either of them engaged the enemy. U-2511, under the command of experienced U-boat ace Korvettenkapitän Adalbert Schnee, was able to escape the attentions of a number of British escort vessels when they encountered his boat off the British coast in April 1945. A combination of the U-boat's high speed and excellent sound detection equipment allowed him to follow their changes in course and shake them off with relative ease. Four days later, Schnee encountered a group of British warships including a heavy cruiser and carried out a completely successful dummy attack, escaping without detection of the U-boat. Clearly, if the Type XXI had entered service earlier it could have altered the course of the Battle of the Atlantic.

After the end of the war, the victorious Allies showed enormous interest in the Type XXI. Most of the existing boats had been scuttled by the Germans at the close of the war, but a few survived. The US Navy took over U-2513 and U-3008, the Royal Navy took U-3017, the Soviet Navy U-2529, U-3035, U-3041 and U-3515 and the French Navy U-2518. The latter served on with the French until 1967 when it was retired, and finally scrapped in 1969.

Mention should also be made of U-2540. This boat was sunk during a bombing raid of Flensburg in 1945. The boat, although sunk, was not excessively damaged. In 1957 the wreck was raised and taken into the



Some idea of the size of the Type XXI boat may be had from the scale of the dockyard staff standing under her massive rudder. The 'mattress' frame of the Hohentweil radar can just be seen on her conning tower.

Howaldts Werke yard where it was fully restored and refurbished with a redesigned bridge/conning tower structure. On 1 September 1960, it was commissioned into the new West German Bundesmarine as U-Wilhelm Bauer, commemorating the 'father' of the German U-boat. It served not as a front-line boat, but purely as a test bed before being retired in 1983. Thereafter, the boat was restored to its wartime configuration (externally at least – many of the internal fittings are modern) by Lloydwerft in Bremen and passed over to the German Maritime Museum in Bremerhaven, where it is on display to this day.

THE TYPE XXIII

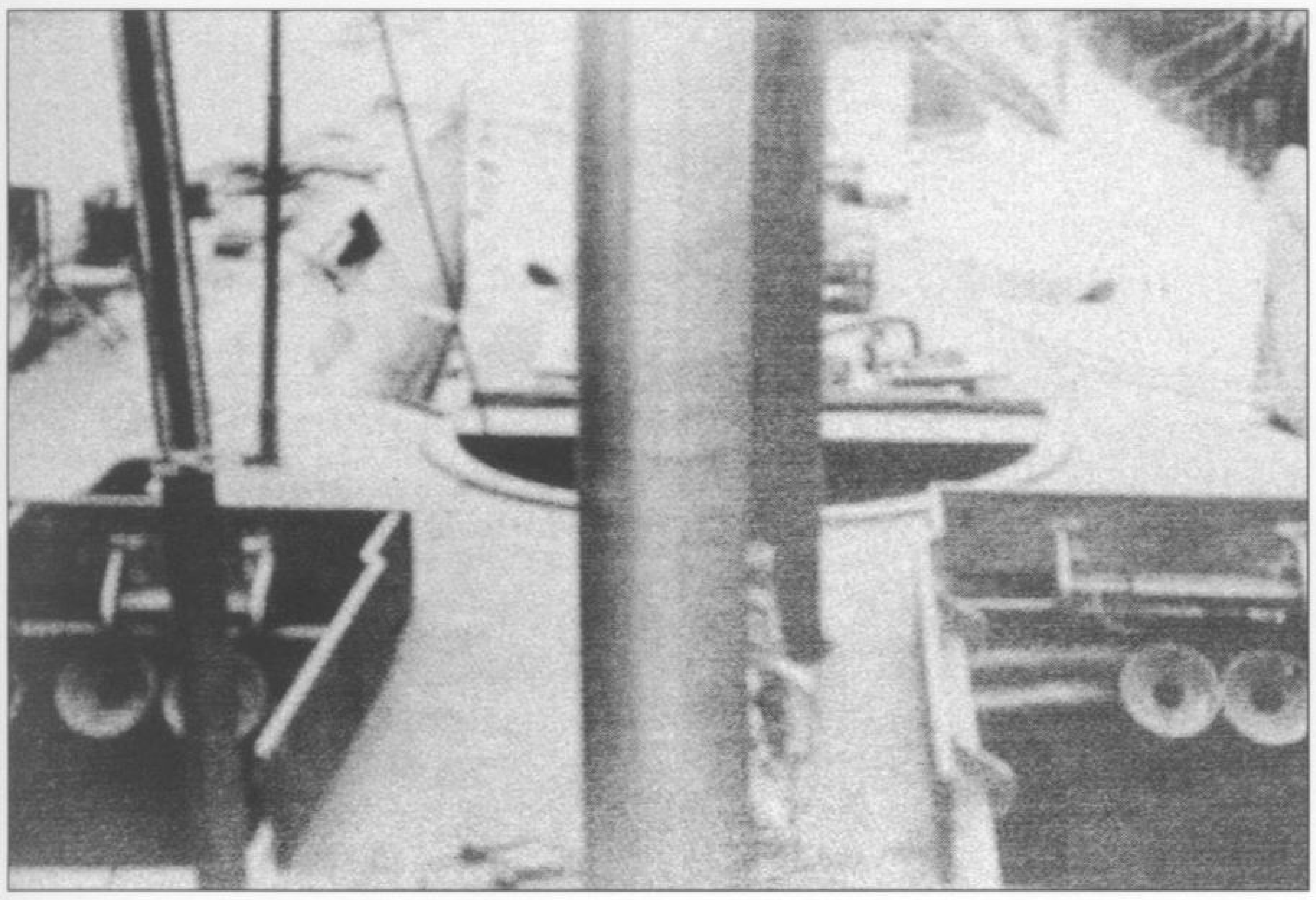
Probably the least well-known of the operational U-boat types in the Second World War, the Type XXIII was, ironically, one of the best. Developed in 1943, the Type XXIII was intended to provide a modern replacement for the obsolete Type II for operations in coastal waters and also, at the insistence of Grossadmiral Dönitz, for use in the relatively shallow waters of the Mediterranean and Black Sea.

As with its larger relative, the Type XXI, it was intended that the boat be constructed in sections, with various modules being manufactured by subcontractors. In the event, Germany's battlefield reverses, shortages of steel and Allied bombing of construction facilities meant that construction was severely delayed and was ultimately concentrated at Germaniawerft in Kiel and Deutsche Werke in Hamburg.

The boat was kept as simple as possible. It had a simple, single hull of all-welded construction, with the small conning tower as its only external structure above the waterline. The Type XXIII featured a single propeller and single rudder. Only two torpedo tubes were fitted and, due to the small size of the boat, no reloads were carried. The torpedoes were loaded into the boat in a rather ingenious fashion. Floated out to the boat on a barge or raft, they were inserted into the tubes manually, from the exterior, tail first. In order to facilitate this, the boat had to be ballasted so that it became stern heavy, lifting the bow tubes clear of the water.

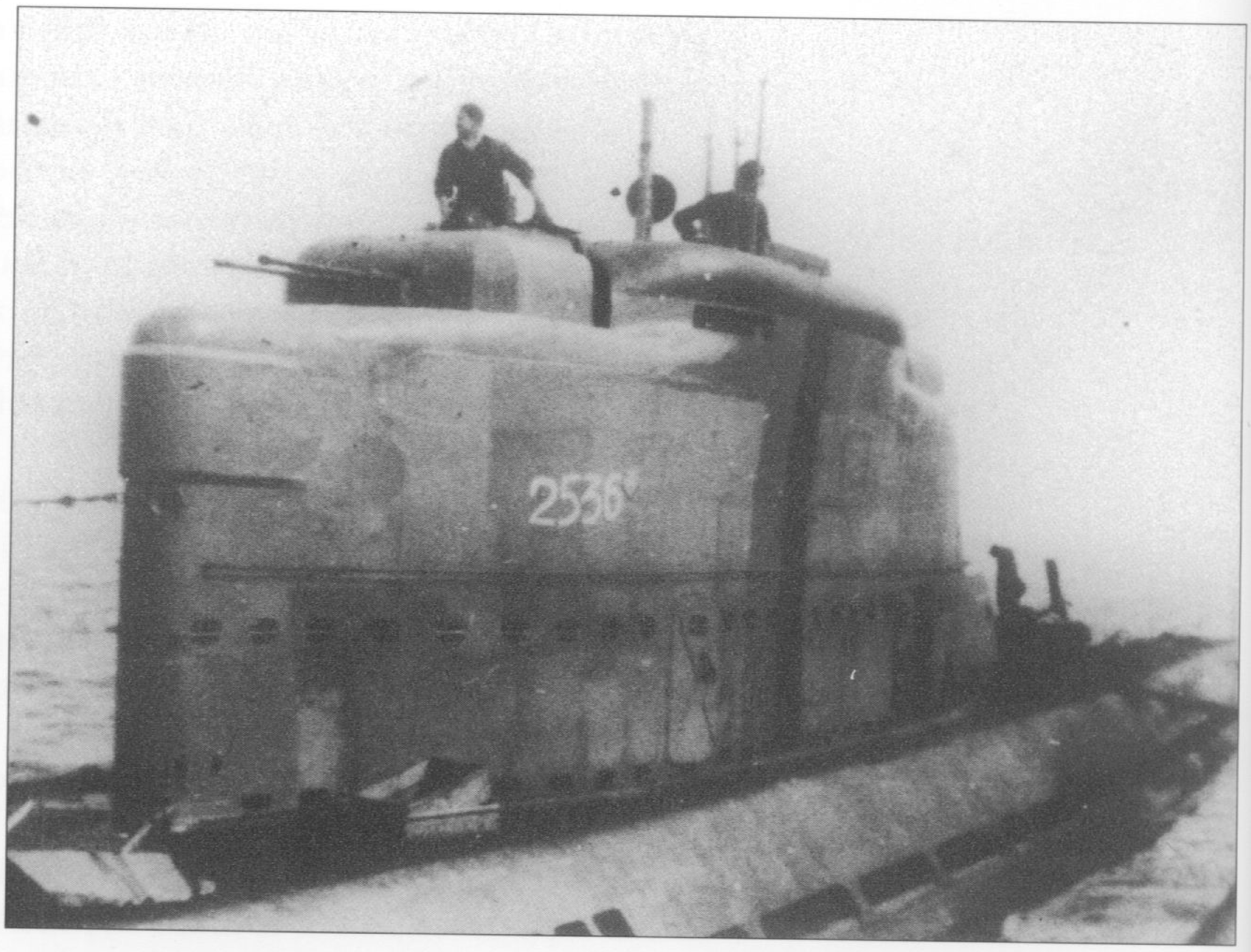
Intended for operation on patrols of relatively short duration (with only two torpedoes available) in coastal waters and with a snorkel breathing device fitted, it was assumed that these boats would spend most of their time submerged. No exterior decking was therefore provided, and this in turn assisted in the streamlining of the boat and a substantial reduction in drag. Set into the forward face of the conning tower was a small watertight container that held an inflatable life raft.

A view along the top of the conning tower of a Type XXI, looking forward, shows the two openings either side of the periscopes. They are the commander's and watch officer's positions, in which can be seen the voice tubes.



Only a modest single 630 bhp diesel was fitted but, like its larger cousin the Type XXI, this boat had a significantly better battery capacity than earlier boats. This, coupled with its snorkel facility, enabled it to remain submerged for extended periods.

The Type XXIII had a particularly fine standard of seaworthiness, being fast for its size and extremely manoeuvrable. It also had a very fast crash-dive time, of just nine seconds. This brought its own problems, however, and any ingress of water into the boat could cause disaster. Both U-2365 and U-2331 were lost to accidents when water entered the boats and caused rapid sinking. It was also discovered that the assumed maximum depth before hull failure could be expected had been grossly overestimated at some 250 metres. In fact, the maximum safe operating depth was eventually established at just 80 metres.



A view of the streamlined conning tower of a Type XXI, U-2536, under Oberleutnant zur See Ulrich Vöge. Note the forward twin 2 cm flak gun turret. This particular boat was still being worked up when the war ended and did not take part in any actual war patrols. It was scuttled on 3 May 1945.

For the first time ever on an operational U-boat, the torpedoes left the tubes under their own power rather than being ejected solely by compressed air.

The Type XXIII was constructed from just four basic hull modules. The bow compartment contained just two torpedo tubes, with no provision for reloads. Aft of this was the crew accommodation. To port were two sets of bunks followed by a tiny galley and to starboard were three sets of bunks, allowing a total crew accommodation for 20 men. Abaft the main crew accommodation was the *Zentral* with the commander's space followed by the sound room and radio room, all to port, and the diving planes, main electrical and pump controls to starboard. Further astern was the diesel motor room with its single MWN diesel, followed by the electric motor room. With no stern torpedo tubes, the aftermost compartment contained the boat's tiny W.C. Only a single periscope was fitted to the Type XXIII, along with a snorkel mast.

The first Type XXIII, U-2321, was launched at Deutsche Werke on 17 April 1944. A total of 62 Type XXIIIs entered service before the end of hostilities, of which only about six actually had the opportunity to carry out operational war cruises. During these, however, four enemy ships were sunk, and no U-boats lost. The first Type XXIII to carry out an operational war patrol was U-2324, which set off from Kiel on 18 January 1945. Although she survived the war, no sinkings were achieved. The first Type XXIII to achieve combat success was U-2322, under the command of Oberleutnant zur See Fridtjof-Heckel. Setting off from her Norwegian base on 6 February 1945 she encountered a convoy near Berwick on the Scottish coast and sank the small coaster *Egholm* on 25 February. U-2321, also operating from the same Norwegian base as U-2322, sank the coaster *Gasray* on 5 April 1945 off St Abbs head. More successful was U-2336, under Kapitänleutnant Emil Klusmeier, which sank two ships, the 1,790-ton *Sneland* and the 2,880-ton *Avondale Park*, also off the Scottish coast, on 7 May 1945.

These were the last two ships to be sunk by U-boat action during the Second World War.

After the end of the war, two scuttled Type XXIIIs (U-2365 and U-2367) were raised and restored. These boats, commissioned into the West German Bundesmarine as the *Hai* (Shark) and *Hecht* (Pike), respectively, provided the nucleus of the second rebirth of the U-Bootwaffe.

SPECIFICATIONS

Length	34.7 m
Beam	3.0 m
Draft	3.7 m
Displacement	234 tons surfaced, 275 tons submerged
Top Speed	9.7 knots surfaced, 12.5 knots submerged
Endurance	4,450 nautical miles surfaced, 285 nautical miles submerged
Powerplant	1 x MWN 6-cylinder 630 bhp diesel, 1 x AEG 35 bhp electric motor, 1 x BBC electric manoeuvring motor
Armament	2 bow torpedo tubes
Crew	14

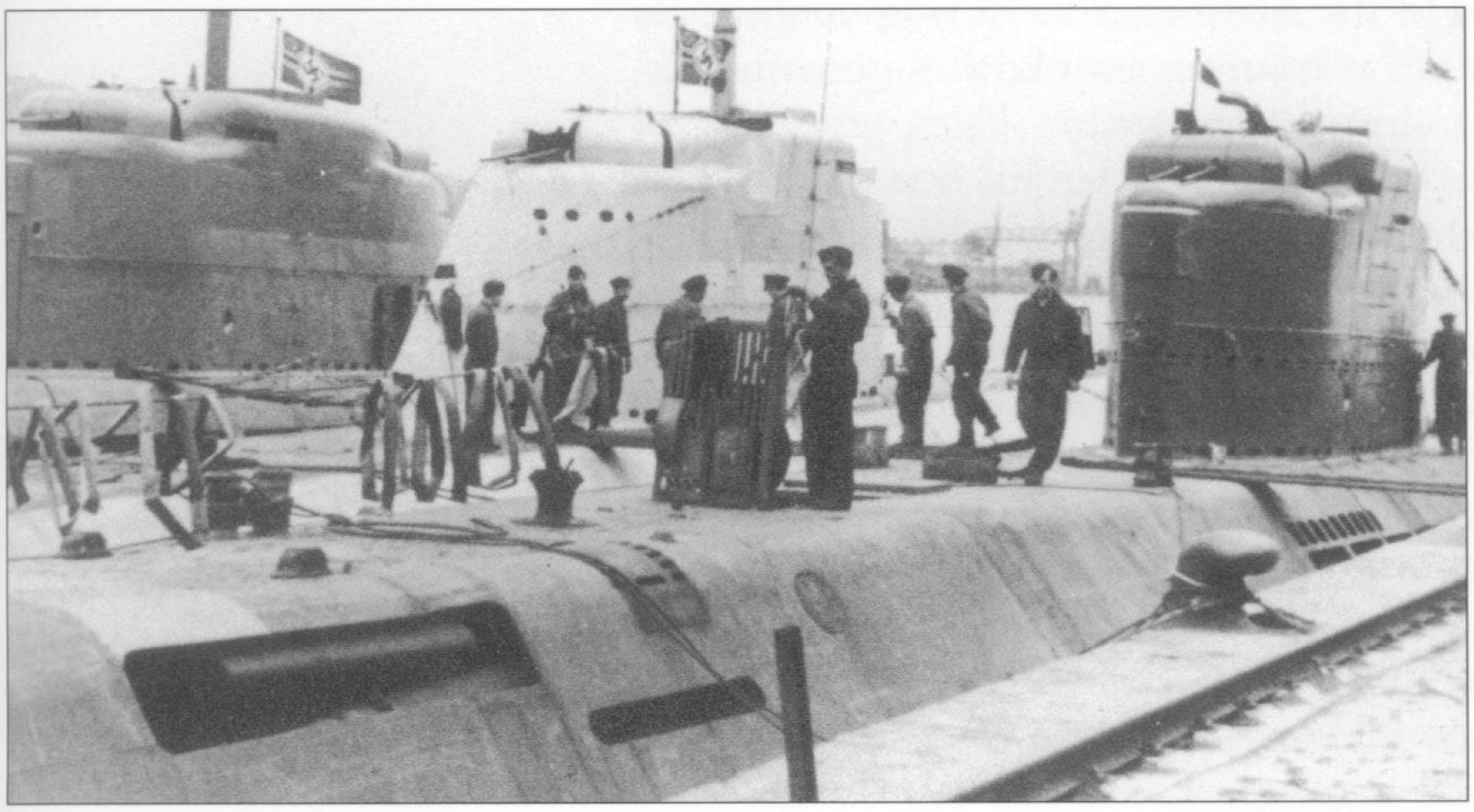
Construction Details

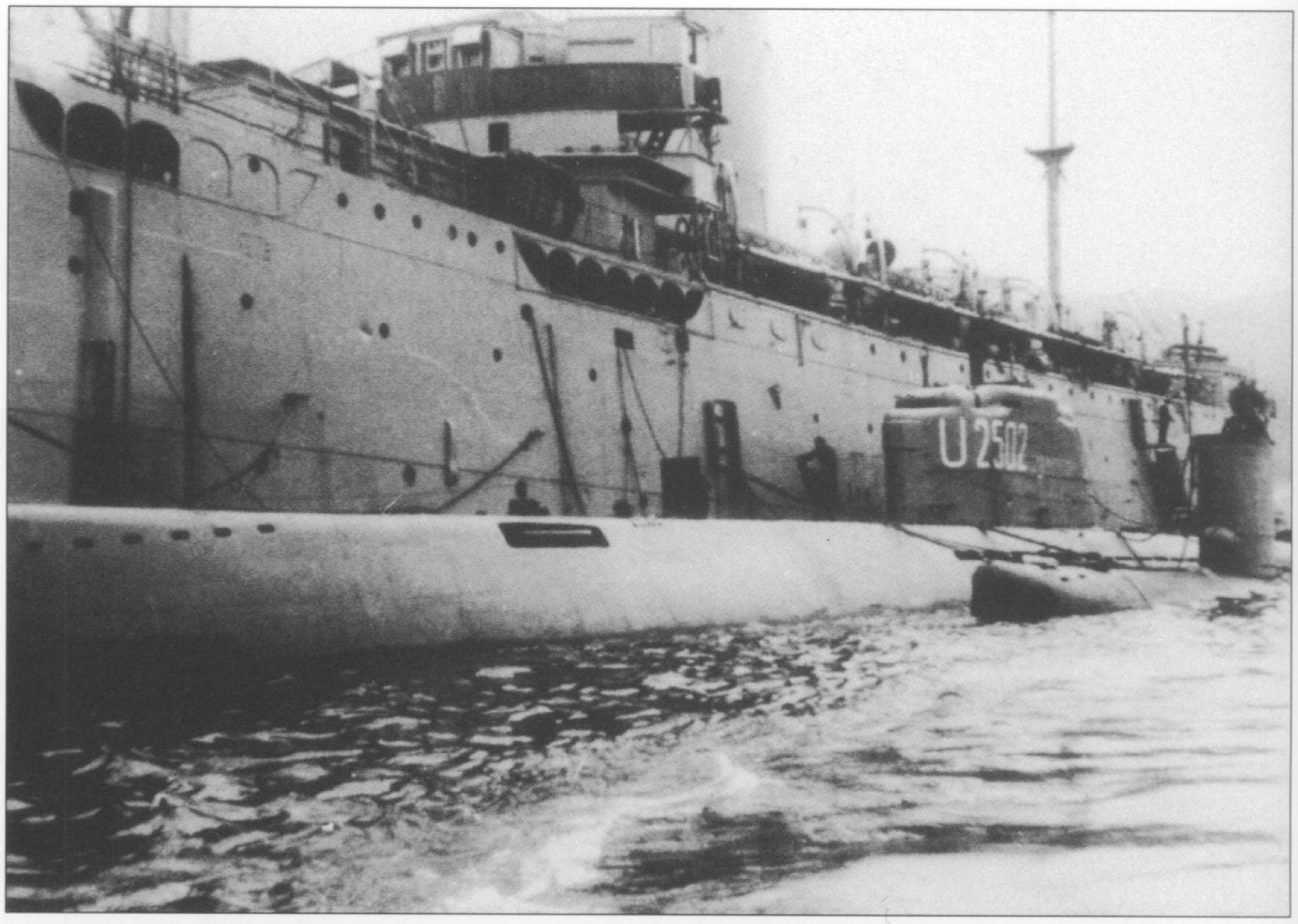
Deutsche Werke, Hamburg	
U-2321 to U-2331	11 boats
U-2334 to U-2371	38 boats
Total	49 boats
Germaniawerft, Kiel	
U-2332 to U-2333	2 boats
Total for Type	51 boats

THE WA201

This was an experimental design intended to utilise the revolutionary new propulsion system developed by Dr Helmuth Walter. Hydrogen peroxide was broken down using a catalyst to provide steam and oxygen, which were then mixed with water and diesel fuel, and the mixture combusted. The resultant products were very high temperature steam and pressurised carbon dioxide, which drove a turbine. The waste products were expelled, and remaining water recirculated. The system worked superbly. An earlier experimental boat, although having poor handling characteristics when on the surface, achieved underwater speeds of up to 26 knots.

Three Type XXIs in port. At left is U-2506, at right U-3514 and in the centre U-2511 with its distinctive white-painted tower. This was the boat commanded by Korvettenkapitän Adalbert Schnee. It carried out two war patrols, including a successful undetected dummy attack on British warships after the order to cease aggressive actions had been given. The boat was surrendered at Bergen in May 1945.





A Type XXI, U-2502, tied up alongside a diminutive Type XXIII. This boat was commanded by Knight's Cross winner Kapitänleutnant Heinz Franke, but did not carry out any war patrols prior to the end of hostilities. She was surrendered at Horten in May 1945. This photo gives a good idea of the disparity in sizes between these two advanced late-war boats.

The Wa201 (the Wa prefix identifying the designer, Walter) was produced by the Blohm & Voss yard in direct association with Dr Walter, whilst Germaniawerft produced a second variant, the WK202. Four boats were completed, and were taken into service as U-792 and U-793 (Blohm & Voss), and U-794 and U-795 (Germaniawerft), respectively. All were used solely as test boats, and the build quality and efficiency of the Blohm & Voss boats was found to be superior. All four had numerous teething problems, always associated with revolutionary new designs, and were eventually laid up and finally scuttled in 1945.

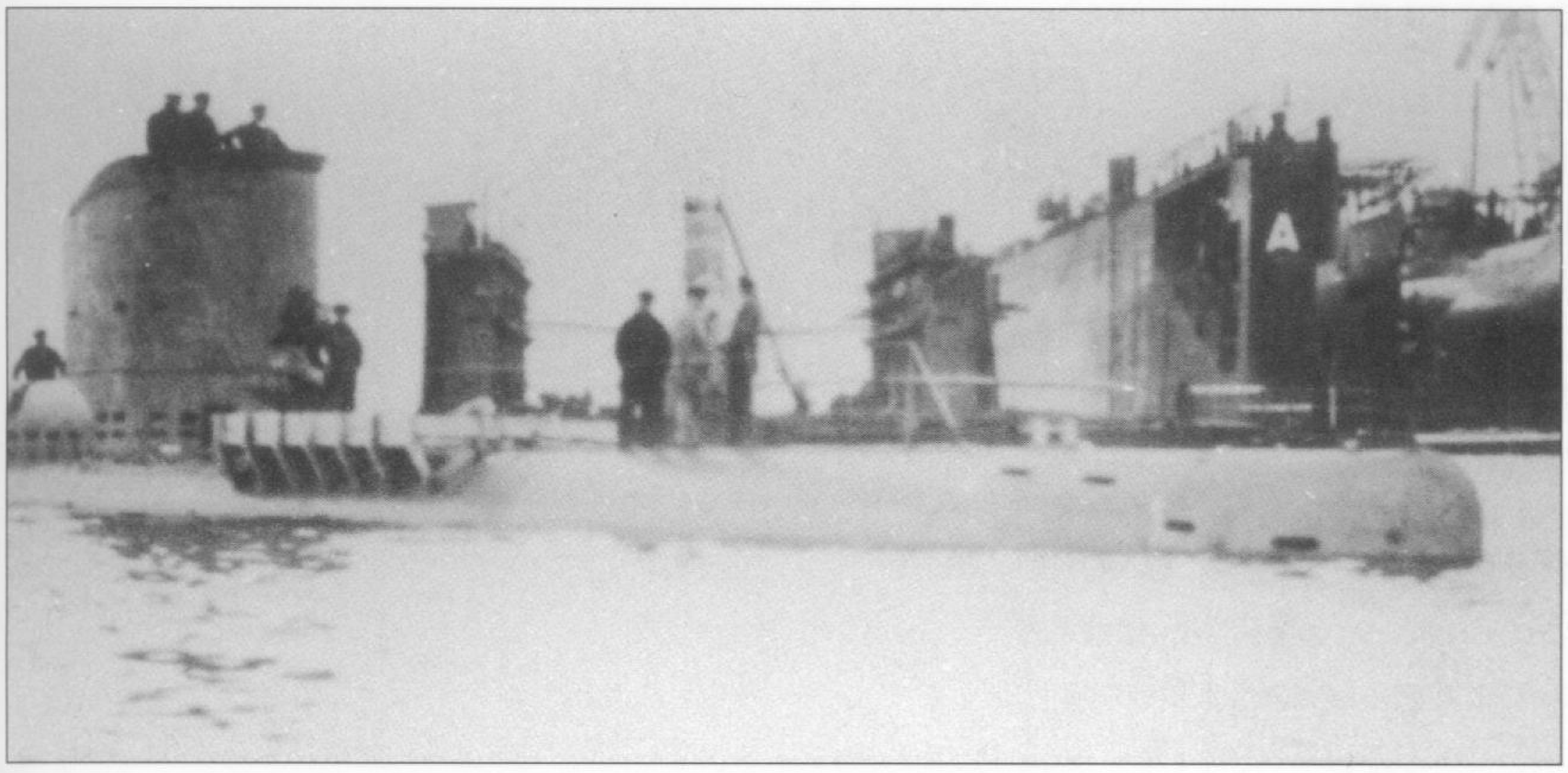
THE TYPE XVIIB

The Type XVIIB was a direct successor to the Wa201, but larger and outfitted with two bow torpedo tubes as well as a snorkel system. Only three (U-1405, U-1406 and U-1407) were eventually commissioned, all being built by Blohm & Voss. The three were scuttled in 1945, but U-1407 was raised, repaired and taken into service in the Royal Navy as HMS *Meteorite.*

FOREIGN SUBMARINES

It is worth making brief mention of the small number of foreign submarines taken over and used by the Kriegsmarine during the Second World War. Most were used simply as training vessels, though some did see combat action, and indeed combat successes.

Probably the most significant of these was UA. This boat had in fact been constructed in a German shipyard on contract for the Turkish Navy as the *Batiray*. It had been completed and was at the point of being delivered to the Turks when war broke out and was taken over instead by the Kriegsmarine. Having been built in Germany to German standards, she was an easy enough vessel for the German crew to adapt to. In appearance, she was very similar to a German Type VII boat but with the deck gun mounted on a platform built on to the forward part of the conning tower. UA carried out seven war patrols, in the course of which she sank seven enemy ships totalling almost 41,000 tons, and damaged one other. She did, in fact, survive all her war cruises, only to be scuttled in May 1945 in Kiel as the war drew to a close.



A Type XXIII during trials. The decking just forward of the bridge is a temporary wooden structure. Shown here is U-2332, which was scuttled at Hamburg on 3 May 1945.

One of the more interesting submarines to serve with the U-Bootwaffe was HMS *Seal*. This boat, a minelayer, had been damaged in action and unable to submerge, and was captured by the Germans. Repaired, she was taken into the Kriegsmarine as UB. She was, however, only ever used for training duties and saw no combat action. The reverse, of course, also happened; U-570 was captured and taken into service with the Royal Navy as HMS *Graph*.

Norway, too, contributed a number of submarines to the U-Bootwaffe. The bulk of the Norwegian submarine fleet was scuttled when the Germans invaded (one escaped to Great Britain). The Germans raised three, however, two of which did see service as UC1 and UC2, their duties purely with the training flotillas. UC1 was broken up in 1942 and UC2 was scuttled in 1945.

From the Dutch Navy's fleet of twelve submarines, seven escaped to Great Britain. The five that remained were taken into the U-Bootwaffe as UD1 to UD5. UD1, UD2 and UD4 were used purely as training boats. UD3, however, did carry out one war cruise, sinking a 5,000-ton freighter. She eventually returned to training duties before being scuttled in 1945. UD5 also undertook a single war cruise, sinking a 7,600-ton freighter before she too returned to training duties for the remainder of the war.

The invasion of France saw three partially completed submarines fall into German hands. They were taken over as UF1, UF2 and UF3. The construction of UF1 was never completed. UF2 was completed and used as a training boat. UF3 was also completed but for some reason never became operational.

The greatest number of foreign boats taken into the Kriegsmarine was from Italy, following the Italian surrender to the Allies. These were all designated with UIT numbers. UIT1 to UIT6 were in different stages of construction when taken over by the Germans. Most were destroyed in bombing raids either before or just after launching. None ever entered operational service.

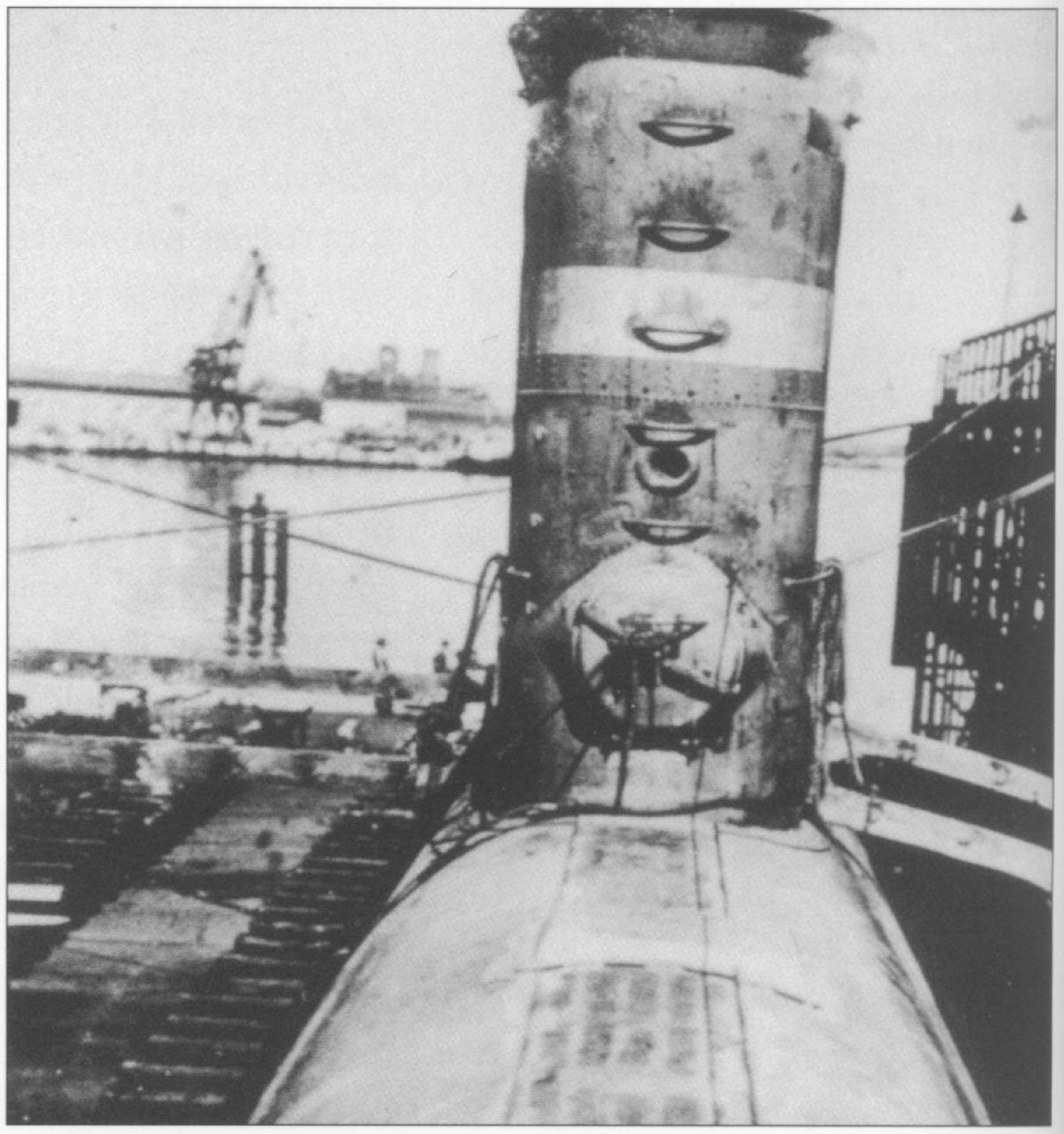
A second batch, all submarines that were already in operational service before being taken over, were allocated numbers UIT21 to UIT25. UIT21 and UIT22 were in port in Bordeaux when the Italians surrendered. UIT21 was never used operationally and UIT22 was sunk in an RAF bombing raid on the port. UIT23, UIT24 and UIT25 were all operating in Far Eastern waters. All were seized by the Japanese in Singapore harbour and handed over to German crews. UIT23 was sunk by Allied aircraft whilst making her way back to Europe. UIT24 and UIT25 remained in German hands in the Far East until they too surrendered, at which point they were seized back by the Japanese. It is not believed that any saw operational use.

MIDGET SUBMARINES

These weapons were the preserve of the Kleinkampfmittelverbände, usually referred to in its abbreviated form as the K-Verbände. This department, formed in late 1943 and commanded by Konteradmiral Hellmuth Heye, specialised in the use of relatively crude and simple, mass-produced 'last gasp' weapons in the closing stages of the war. These included a number of midget submarine types, some of which were actually successful in sinking enemy ships but which, in reality, had little or no effect on the course of the war. These vessels were almost as dangerous to their crews as to the enemy, and the attrition rate amongst crews was frightful. There were many projected designs, some of which never progressed beyond the drawing board. In order of size and complexity, those which were actually constructed included the following types of vessels.

The Neger

This was basically a manned torpedo, without warhead, with the pilot sitting at the forward end in a small cockpit with a plexiglass bubble canopy. Neger was in fact incapable of diving and many were spotted and shot on the surface by enemy warships. As a measure of improvement, a small diving cell was fitted, the new version being known as the Marder. This gave the pilot some chance of avoiding the enemy on his way to the target area, but even the Marder had to surface before firing its payload. Beneath the manned section was slung a standard live torpedo. The Neger/Marder simply lined itself up on the target and fired. Around 200 of these were produced, but the type was not particularly successful and losses were very heavy, so much so that operations were ceased in autumn 1944.



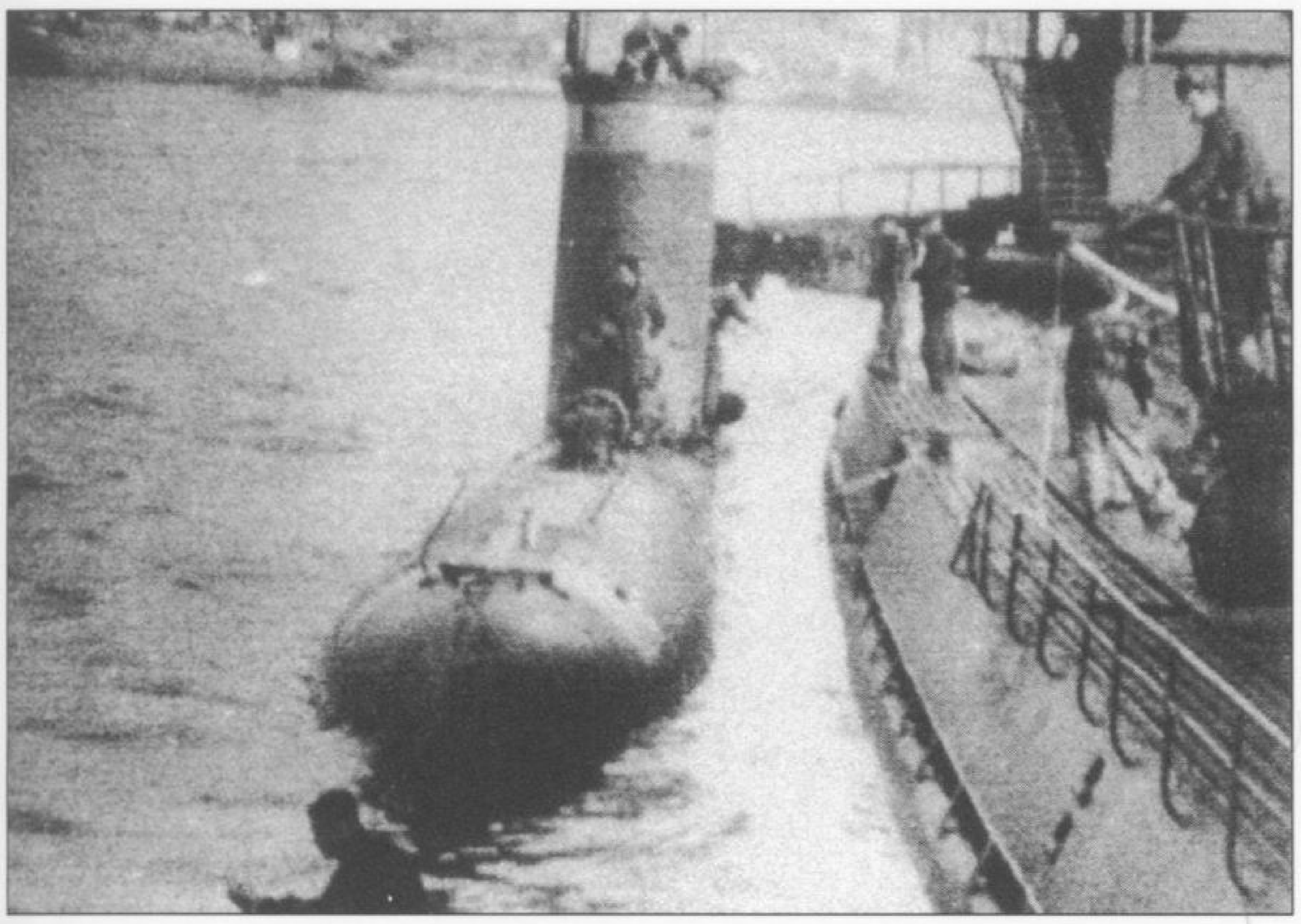
A view along the foredeck of a Type XXIII, in this instance U-2321, commanded by Oberleutnant Hans-Heinrich Barschkiss. This boat was one of the few of this type that undertook combat patrols in the final stages of the war. Note the very narrow walkway along the foredeck and the circular compartment at the base of the tower, which was actually a watertight container for an escape dinghy.

The Biber

The Biber measured just seven metres in length and weighed three tons. It had a cylindrical hull with a small observation tower just forward of midships, and was propelled by a petrol-driven Opel Blitz truck motor for surface travel and a battery-powered electric motor for submerged travel. Its top speed on the surface was seven knots and submerged six knots. Radius of action was around 90 nautical miles. Maximum depth of 25 metres was attainable. The Biber carried two torpedoes slung externally in concave indentations in the lower hull. Around 320 Biber were produced. Although they scored no sinkings in their first action on the Normandy invasion front in August 1944, all the vessels that took part returned to base safely, itself quite an achievement. Subsequent operations, however, saw heavy losses incurred.

The Molch

The Molch was a one-man submarine with a 12-metre-long cylindrical hull, the forward three-quarters of whose length was packed with



U-2329, tied up in Stavanger alongside a larger Type IX. This boat was used in combat but did not succeed in sinking any enemy ships.

batteries to power the motor. In the rear was the pilot's compartment, with hatch and periscope. This vessel was capable of diving to 30 metres and had a range of 100 nautical miles. One torpedo was slung on each side of the lower hull. Almost 400 of these craft were built, and were used at Anzio and along the Dutch and Belgian coasts. They had very poor handling characteristics, however, and were far from successful, suffering losses disproportionate to their rare successes.

The Hecht

The Hecht, officially known as the Type XXVIIA, was a two-man submarine 10.4 metres in length and displacing some 12 tons. Electrically powered, it could achieve a top speed of some six knots and could dive to 50 metres. A single torpedo was carried, slung beneath the hull. A total of 53 Hecht were built, though the type does not seem to have been particularly successful, mostly being used for training purposes.

The Seehund

The largest of the midget submarines, Seehund was a direct descendant of the Hecht, but longer, at 12 metres, and heavier, at 15 tons. Seehund was equipped with a 60 bhp diesel engine for surface travel, where it could make over seven knots with a range of around 300 nautical miles. Driven by its electric motor, it could achieve six knots submerged. Two torpedoes were carried externally, slung against the lower hull, one to each side. With excellent handling characteristics, and capable of diving to 50 metres, this was by far the best of the German midget submarines. It has been estimated that up to 90,000 tons of enemy shipping were sunk in operations using the Seehund.

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COLOUR PLATE COMMENTARY

A: EARLY TYPE IX MODELS

This plate shows some of the earlier Type IX models, the A and B variants. Top (1) is U-40, a Type IXA, shown in her pre-war livery of pale grey, with the boat number painted in white on the side of the tower. Note that she lacks the spray deflector added later to most boats midway up the conning tower. She also still retains the bow net cutter, which was removed from most (but not all) boats before the outbreak of war. The boat numbers painted on the tower (and also on a small plate either side of the bow) were also removed prior to the outbreak of war. U-40 adopted her own boat emblem of a cupid figure sitting astride an artillery shell (2) and this was painted either side of the tower just below the spray deflector that was added later. Not yet having been used on combat operations, she is still in pristine condition.

In the centre (3) is U-38, another Type IXA, shown in slightly modified form in the early part of the war. Her net cutter has been removed and she has had the spray deflector added to her conning tower. U-38 was somewhat unusual in sporting a strong camouflage pattern of dark grey blotches over the light grey hull. On the front of her tower was painted a large white skull and crossbones emblem and to each side, just below the spray deflector, was a white circle surrounding a red, closed, umbrella. Having seen combat out in the Atlantic, she is showing some weathering to her paintwork.

The lower boat (4) on this plate is U-107, an early Type IXB. She is in the standard pale grey livery used in the early part of the war. Her upper surfaces (decking etc.), when viewed from above, were dark grey, a standard scheme on most warships to make aerial detection more difficult. The emblem adopted by U-107 was the four ace playing cards.

Readers observing photos of Type IX boats will notice that there were several different configurations to the railings along the hull side, as there also was to the exact configuration to the drain holes along the outer hull, through which water escaped the free-flooding area when the boat surfaced. These details differed from type to type and sometimes from shipyard to shipyard. The small orange inverted horseshoe shape seen on the side of the conning tower of most U-boats was a life preserver.

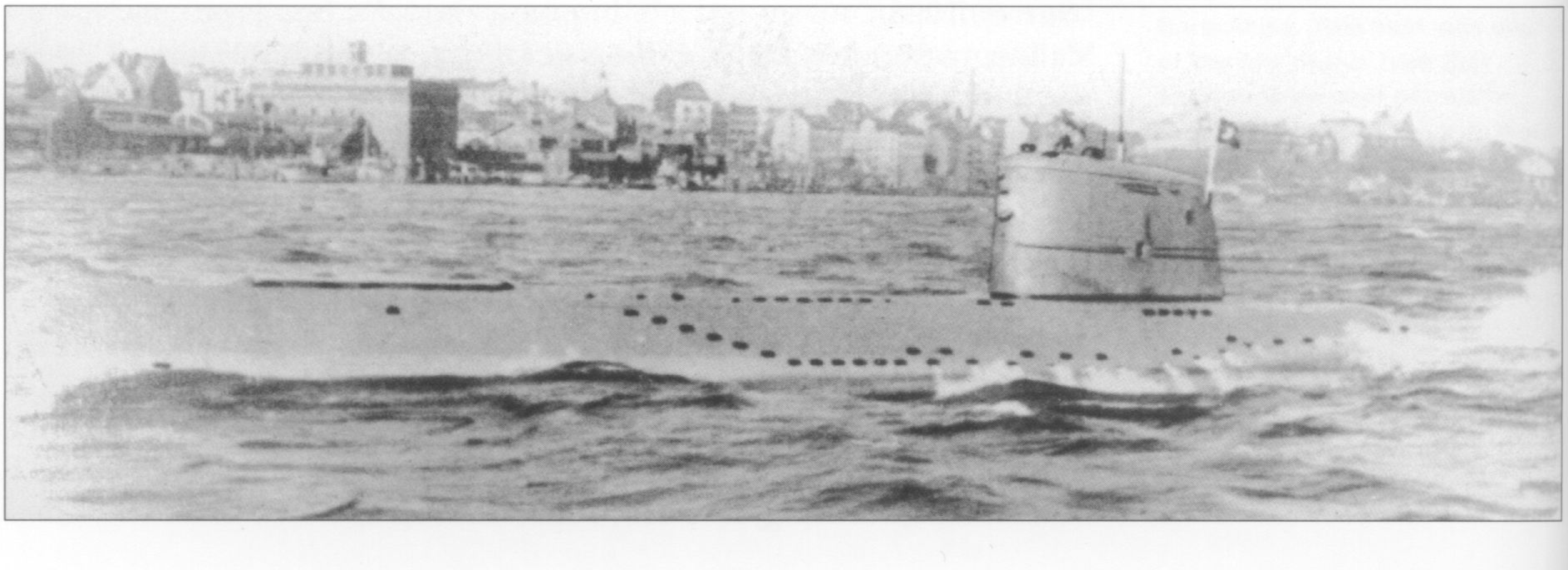
B: A TYPE IXD RECHARGING HER BATTERIES

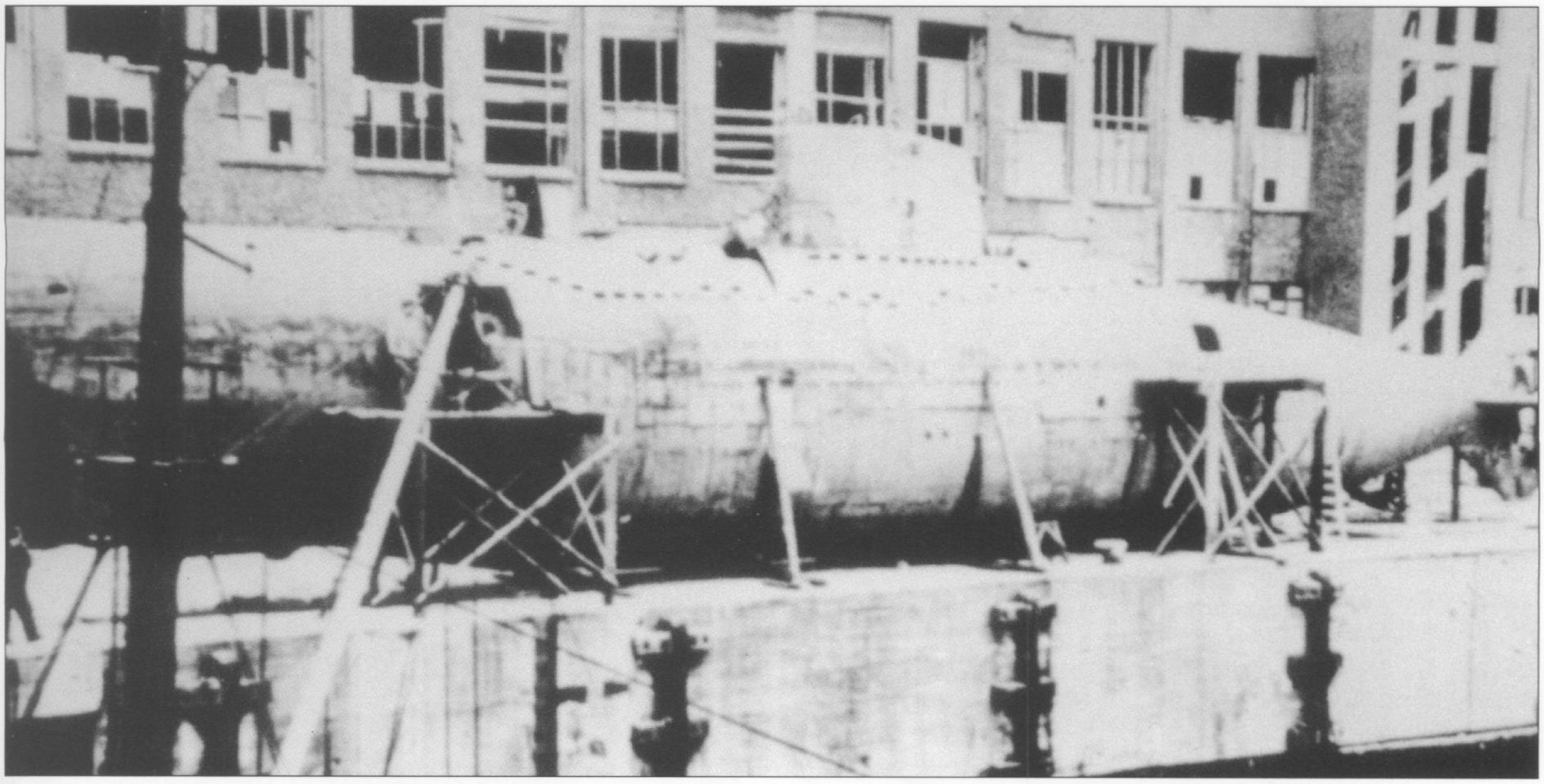
This Type IXD is shown running on the surface at night, using her diesel engines to recharge the batteries for her electric motors. The bright moonlight makes this a risky business. Boats would much rather run on the surface in fog, or low cloud, making them much harder for enemy aircraft to detect. With the advent of improved airborne radar, even such natural 'cover' would provide scant protection. Not until the advent of the snorkel breathing tube would U-boats be able to recharge their batteries by running the diesel engines whilst still submerged. Even this was not totally safe, as the snorkel head, being above water, could be detected by radar, and special anti-radar coatings were developed. This boat's gun crews are closed up and her bridge watch keeps an anxious eye on the skies as the recharging continues. The boat shows considerable wear and tear from her sortie into the storm-wracked waters of the mid-Atlantic.

C: TYPE XXI AND XXIII U-BOATS

This plate shows the most advanced U-boats developed and put into use by the Kriegsmarine during the Second World War. At top (1) is the superb Type XXI. Unlike most older boats whose maximum speed under water was only half, or even less, of their surfaced speed, the Type XXI could move faster under water than many ships on the surface. The type was designed with streamlining in mind, to reduce underwater drag as far as possible. Despite the fact that even the extremely heavy flak defences provided to some late-war Type VII and Type IX boats had proven ineffective against determined aerial attack, the Type XXI was still provided with two twin 2 cm flak mounts in streamlined turrets set into the conning tower. All projecting objects, such as periscopes, radar, snorkel etc., were fully

A fine shot of U-793, another Type XVII 'Walter-Boat' during its trials. This example was scuttled in May 1945 by her commander, Oberleutnant Friedrich Schmidt, but was raised by the Royal Navy and used as a test boat for two years, finally being scrapped in 1947.





A rare shot of a Type XVII 'Walter-Boat', the U-1406. Her commander, Oberleutnant Werner Klug, scuttled her at Cuxhaven in May 1945, but she was raised a few months later and shipped to the USA where she was subjected to intensive testing until being scrapped in 1948.

retractable into special housings within the tower, again reducing underwater drag.

This illustration shows U-2511, commanded by Adalbert Schnee and one of only two Type XXIs that actually carried out a war cruise. Schnee had the tower of his boat painted white, as this was believed to make it less conspicuous from the air. It was doubly apt to have a white tower on his boat, as Schnee's name is German for snow.

Central (2) is the excellent Type XXIII. This coastal boat, like the Type XXI, sacrificed external fittings for streamlining. There was no outer deck casing to speak of, apart from a narrow flat walkway down the foredeck. A tubular housing set in the face of the tower held an inflatable life raft. These were excellent boats, though somewhat limited in having only two torpedoes and no reloads. The last U-boat victories of the Second World War were scored by a Type XXIII. This view shows U-2367 after being raised (having been scuttled in May 1945) and recommissioned as the *Hecht*.

At bottom (3) is the experimental Wa201, a Type XVII powered by the revolutionary Walter turbine. Developed too late to be put into operational use, these boats were used purely as test beds. So great was the Allied interest in them that U-793 was commissioned into the Royal Navy after the war and used for extensive testing in 1947.

D: INTERIOR LAYOUT OF A TYPE IX

This sectional view shows the interior of a typical Type IX. Roomier than the Type VII, the interior layout was broadly similar to the smaller Type VII. Moving from the bow towards the stern, the forwardmost compartment was the bow torpedo room, where the four bow tubes pierced the pressure hull. Here were also stored most of the torpedo reloads, including two stored below the deck plates. In the roof of this compartment was a slanted entry hatch, which allowed torpedoes to be introduced from the forward deck. To the rear of this compartment was the crew accommodation area, with hinged bunks either side, which could be chained up to provide more room when necessary. Foldaway tables were also provided for the crew's use. Spare torpedoes were also stored under the deck plates of this compartment.

Moving aft, the next area holds the NCO accommodation, the forward part housing the junior NCO grades and the forward W.C., and the after part the senior NCOs. The galley and pantry separated the NCOs from the officers. Directly across the gangway from the captain's compartment were the radio and sound rooms. Under the deck plates in this area was the main battery storage.

As with all boats, the nerve centre of the vessel was the control room or *Zentral*. Here were the periscope controls, dive planes, main pumps, electrical switchboard, navigator's table etc., and ladder leading up into the conning tower and commander's battle station with its attack periscope and attack computer. Aft of the control room was the generator motor room. Further aft were the electric motor room from where the boat was powered when under water and the diesel motor room from where the boat was powered when on the surface.

The aftermost compartment was the stern torpedo room, with two torpedo tubes, a small workshop area with a lathe, stern W.C. and the emergency helm.

E: TYPE IX VARIANTS AND THE XB MINELAYER

At top (1) is shown a rather interesting example of the Type IXC, U-511. After seeing combat service with the Kriegsmarine, this boat was sold to Japan and was commissioned into the Imperial Japanese Navy as RO500. Here we see her as she appeared in Japanese colours, with the Japanese flag painted on to the side of the tower below the spray deflector and, above this, her boat number painted in white. Typical of Type IXCs, she has the second 'wintergarden' flak platform, but in her case with an additional 2 cm gun fitted and not the heavy 3.7 cm flak gun or quadruple 2 cm flak gun of later boats. She still retains the 10.5 cm deck gun.

Next (2) is shown U-180, an early Type IXD1. This boat was fitted with high-speed diesel engines normally installed on E-boats. The experiment, which was not to Grossdamiral Dönitz's liking, was not particularly successful. Reflecting the high-speed powerplant, her crew selected the Mercedes automobile badge as their boat's symbol. She has the early armament suite of a 10.5 cm deck gun forward, a 'Turm 0' type tower with 2 cm flak gun and a second flak gun mounted on the afterdeck. The most noticeable feature of the Type IXD was the extreme length of the boat when compared to earlier variants.

The third boat (3) on this plate is the ultimate Type IX, the D2 variant, complete with its late-war bridge configuration. The 10.5 cm deck gun is gone, but the flak armament has been considerably beefed up and now consists of two twin 2 cm flak guns on the upper platform and a Flakvierling quadruple 2 cm mount on the lower platform. The boat is snorkel equipped and has the Hohentweil radar mast. Represented here is U-177 (4) that, interestingly, elected an unusual motif. Rather than a painted emblem, the crew affixed a shepherd's crook to the front of the tower, and painted a white ring around the shaft of the crook for each enemy boat sunk.

Finally, we see one of the huge Type XB minelayers (5). As long as the Type IXD, the Type XB was also extremely wide, having mine shafts set into her saddle tanks as well as on the foredeck. This view shows a fairly early configuration. Later modifications to this type included the addition of a lower 'wintergarden' flak platform and a narrowing of the foredeck casing just aft of the bows, this latter modification being intended to reduce the time taken to crash dive. The motto decided on by U-233 was a black chimney-sweep character on a white ground.

F: THE TYPE XXIII U-2336

This plate shows U-2336, under the command of Kapitänleutnant Emil Klusmeier, returning from her last mission of the war on 14 May 1945. Her final victim was the freighter *Avondale Park*, the last boat to be sunk by submarine action in the Second World War. These snorkel-equipped boats were intended to spend most of their time submerged and because of this, and also to reduce underwater drag, no external deck casing was fitted. Even when travelling on the surface, the outer hull would be awash most of the time in anything other than a flat calm sea. With only two torpedoes carried, no reloads, and no defensive anti-aircraft armament,

ABOVE **Schreiber-Obergefreiter Walter Gerhold, seen here in the cockpit of his Neger one-man torpedo as it is raised out of the water after a successful patrol. The large projecting spike in the foreground is actually a primitive aiming sight. Gerhold was decorated with the Knight's Cross of the Iron Cross, for his gallantry as a Neger operator, on 6 July 1944.**

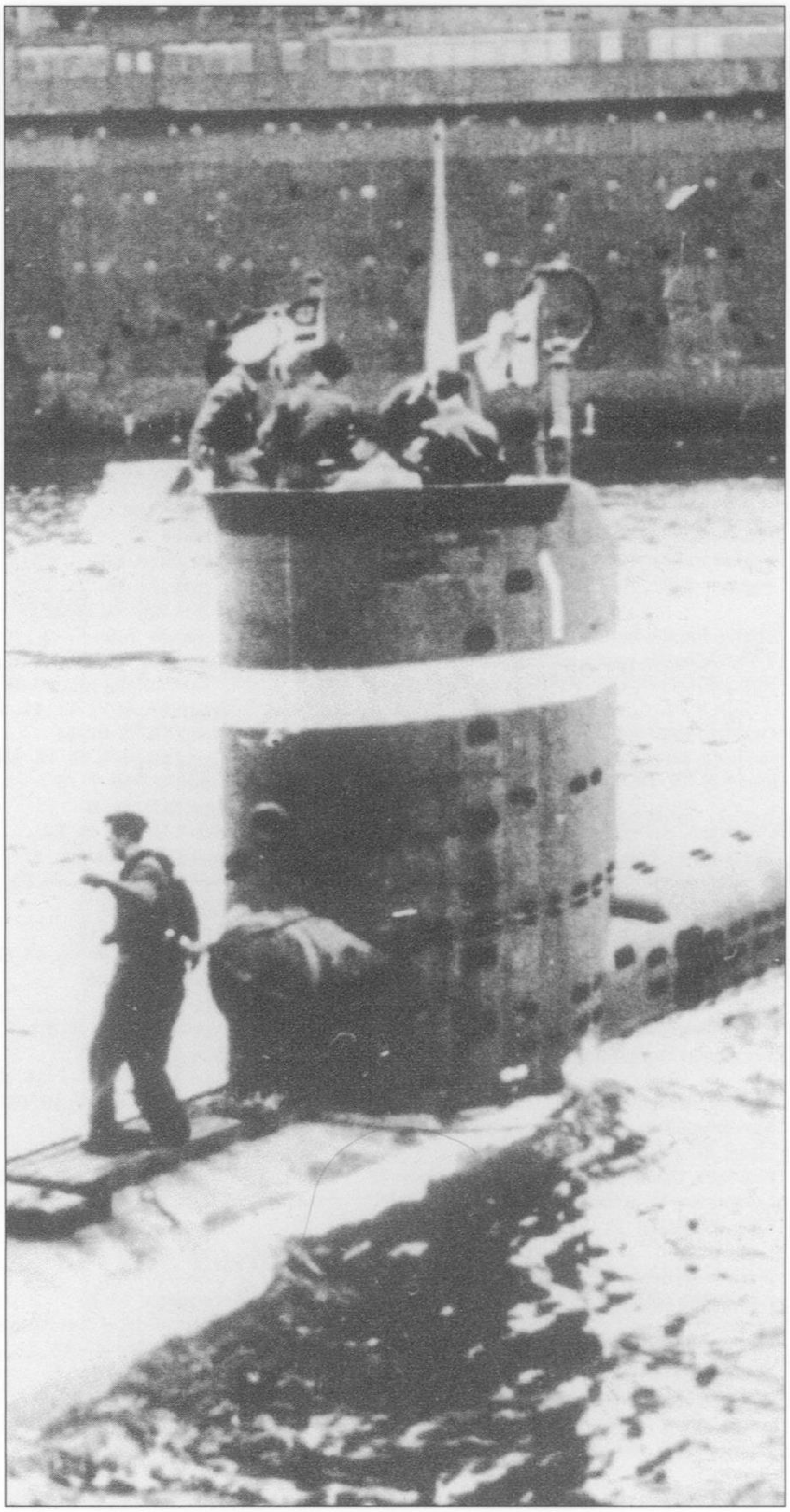
RIGHT **This photograph was taken just after the commissioning ceremony of U-118, a Type IXB. Commanded by Korvettenkapitän Werner Czygan, she was sunk by US aircraft south-west of the Azores on 12 June 1943 after seven successful war patrols. The crowded flak platform shows just how spacious this area actually was.**

once the boat had expended its torpedoes it would have no offensive or defensive capabilities and would make for its home base. The duration of the typical war cruise for a Type XXIII would have been relatively brief. In the event, very few of these excellent boats saw action.

G: MIDGET SUBMARINES

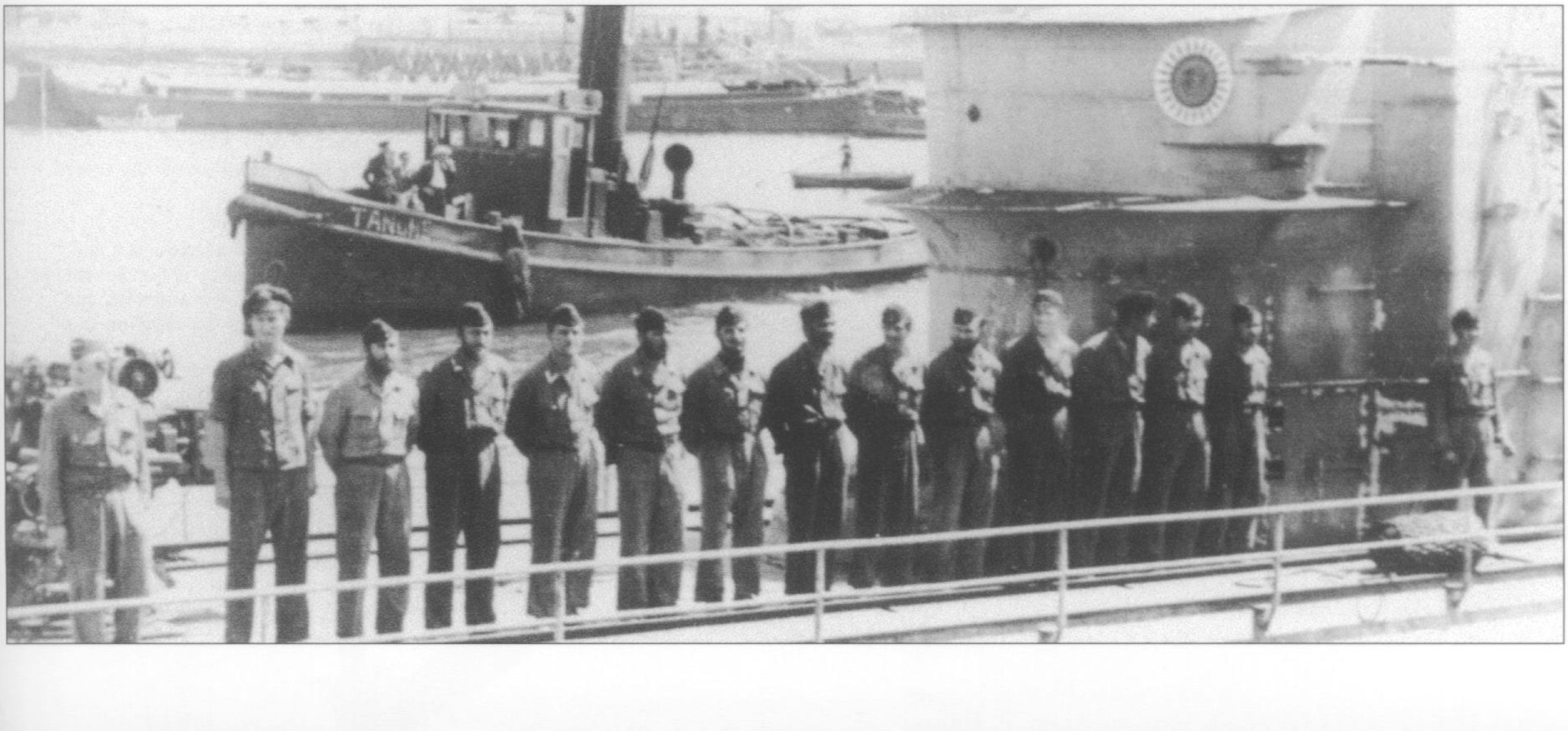
This plate shows some of the midget submarines produced in the second half of the war. The term submarine in this case is somewhat of a misnomer, as not all of them could actually dive and operate submerged in the style of a true submarine. Most of these boats were, in fact, pretty ineffectual, though in some cases large numbers were built. Losses suffered by the units of the Kleinkampfmittelverbände, which operated these boats (none were used by conventional submarine flotillas), were out of all proportion to the meagre successes they scored.

First (1) is the two-man Hecht, a disappointing development that was only used for training duties; second (2), the one-man Molch which did see combat service; third (3), the two-man Seehund, a true mini-submarine that could dive to 50 metres; fourth (4), the one-man Biber used in action off the coast of Holland; and fifth (5), the most appalling of all, the one-man Neger, a dreadful device into which the operator was sealed with no way of opening the plexiglass cockpit dome from the inside.



RIGHT **U-2322, another Type XXIII, which actually saw combat, sinking the SS *Egholm* on 25 February 1945. Commanded by Oberleutnant Fridtjof Hecekl, the boat was eventually surrendered at Stavanger in May 1945. Note that most of the hull is awash when running on the surface.**

BELOW **The crew is mustered on the foredeck as U-159, a Type IXC, returns to port after a war patrol. This boat, under Oberleutnant zur See Heinz Beckmann, was bombed and sunk by Allied aircraft off Jamaica in July 1943 after nine war patrols in which she sank 23 enemy ships.**



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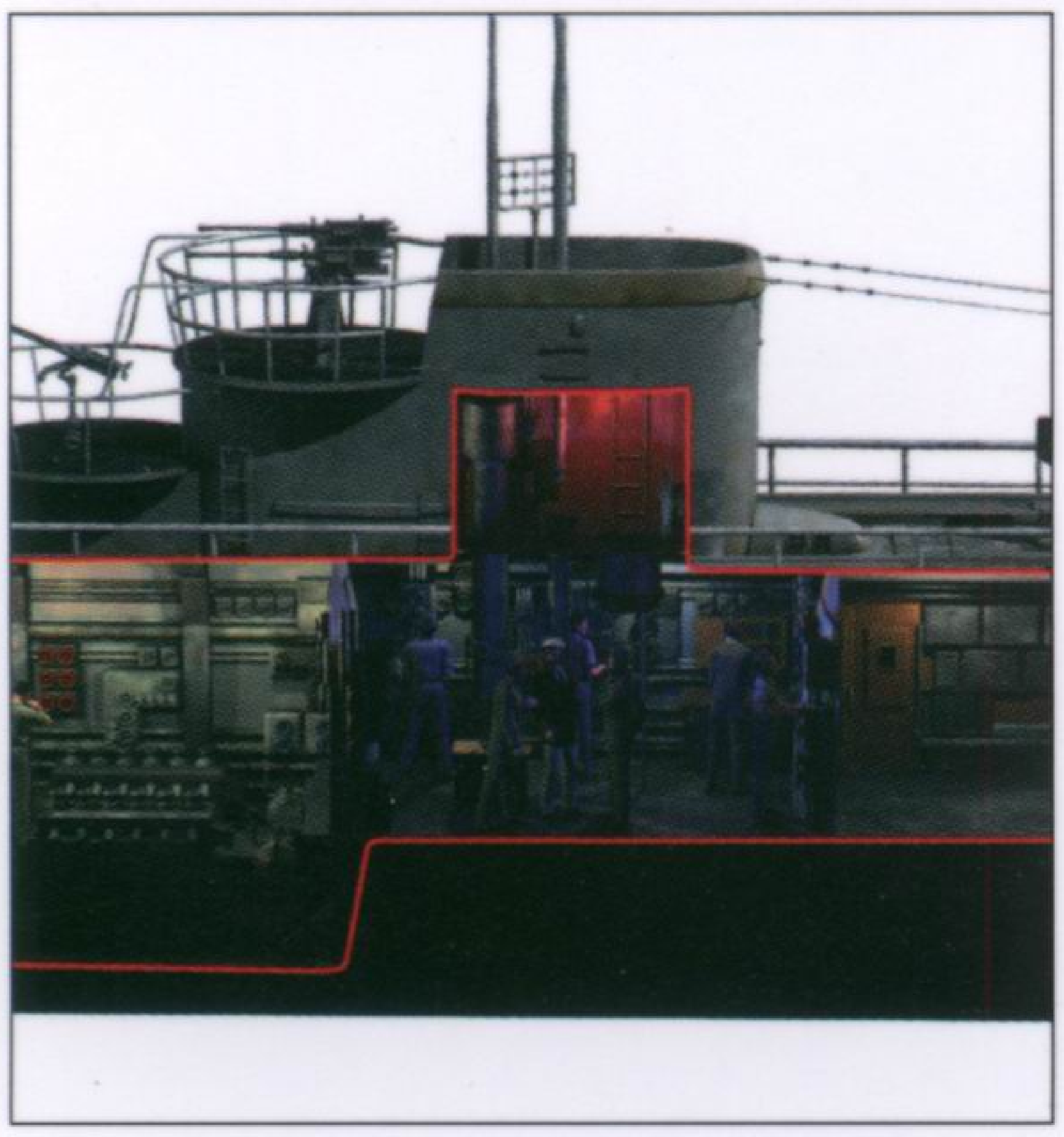

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